626
P191c
no.6

ALTGELD HALL STACKS

THE NEW YORK STATE BARGE CANAL

STATE ENGINEER AND SURVEYOR

1912

LIBRARY OF THE
UNIVERSITY
OF ILLINOIS
COLLEGE OF
ENGINEERING

From the library of
JOHN AUGUSTUS
OCKERSON
CLASS OF 1873
Presented May 1, 1924
by his Widow CLARA
SHACKELFORD OCKERSON

626
P191c
no.6

THE

BARGE CANAL SYSTEM

Return this book on or before the
Latest Date stamped below.
Theft, mutilation, and underlining of books are reasons for disciplinary action and may result in dismissal from the University.
University of Illinois Library

NOAUG 19 REC'D

L161—O-1096

TH K

ALE eer

J. B. LYON COMPANY, STATE PRINTERS
1912

LIBRARY OF THE
UNIVERSITY
OF ILLINOIS
COLLEGE OF
ENGINEERING

From the library of
JOHN AUGUSTUS
OCKERSON
CLASS OF 1873
Presented May 1, 1924
by his Widow CLARA
SHACKELFORD OCKERSON

626
P191c
no.6

BAR EM

BEING CONSTRUCTED BY

THE STATE OF NEW YORK

JOHN A. BENSEL, State Engineer and Surveyor

ALEXANDER E. KASTL, Special Deputy State Engineer

ALBANY
J. B. LYON COMPANY, STATE PRINTERS
1912

Digitized by the Internet Archive
in 2017 with funding from
University of Illinois Urbana-Champaign Alternates

https://archive.org/details/pamphletsoncanal06unse

NEW YORK STATE BARGE CANAL

TO understand the canal enlargement which New York State is now engaged in, a brief glance at the history of canal-building in the state is needed. The first work of interior waterway improvement was performed by two private companies, chartered in 1792. By the end of the eighteenth century they had completed most of their works. About 1808 agitation for State-built canals was begun. In 1817 the work of construction was commenced, the main branch being completed in 1825. Within the next decade several lateral canals were built. This period was closely followed by the first enlargement of three of the chief canals,— a work protracted through many years and not completed till 1862. Then followed some two decades of little activity, during the latter part of which several of the lateral branches were abandoned. In 1884 the period of later improvements was begun by a series of lock-lengthenings, which continued for about ten years. The last decade and a half has witnessed the undertaking of two enlargements, the latter of which is the work now in progress — the Barge canal.

During the history of its canals New York State has opened 1,050 miles of navigable waterways, including a hundred miles of interior lake navigation. In addition there are nearly 500 miles of lake and river navigation along the Canadian and Vermont borders, and 150 miles on the Hudson river. Some 350 miles of these canals have been officially abandoned, while about 50 miles more have fallen into disuse. The work of improvement now going on, known as Barge canal construction, consists of the enlargement of four of the existing canals, large portions of the channels, however, being relocated. On one of these canals this is the second enlargement since its original building, on two this is the third enlargement, while on the other branch it is the fourth.

The four canals being improved are: (1) The Erie, or main canal, which stretches across the state from east to west, joining the Hudson river and Lake Erie; (2) the Champlain, which runs northerly from the eastern terminus of the Erie and enters the head of Lake Champlain; (3) the Oswego, which starts north, midway on the line of the Erie, and reaches Lake Ontario; (4) the Cayuga and Seneca, which leaves the Erie a little to the west of the Oswego junction and extends south, first to Cayuga lake and then to Seneca lake.

The original Erie canal was begun in 1817 and finished in 1825. It had a bottom width of 28 feet, a width at water-surface of 40 feet and 4 feet depth of water. The first enlargement was made between 1836 and 1862. At that time the section of waterway was 70 feet at water-line, 52½ or 56 feet at bottom, according to slope of sides and 7 feet deep. The second enlargement was begun in 1896, when a depth of 9 feet was attempted, but this work was completed only at disconnected localities.

The original Champlain canal, begun in 1817 and finished in 1823, had widths of 26 and 40 feet, respectively, at bottom and water-surface, and 4 feet depth. In 1860 widths of 35 and 50 feet, respectively, at bottom and water-line, and a depth of 5 feet were authorized. In 1870 increased widths of 44 and 58 feet, respectively, and a depth of 7 feet were ordered by the Legislature. This improvement, however, was not completed. The enlargement of 1896–8 called for a depth of 7 feet, but this work also was not completed.

The original Oswego canal, which was begun in 1825 and finished in 1828, had the same dimensions as the original Champlain, namely, 26 and 40 by 4 feet. The first enlargement was started in 1852 and completed in 1862, and gave a channel of the same size as the Erie at that time — 52½ and 70 by 7 feet. The second enlargement, that of 1896–8, was also similar to that of the Erie, a depth of 9 feet being attempted, but the work was never wholly completed.

The original prism of the Cayuga and Seneca canal, which was constructed between 1826 and 1828, was the same in size as the Erie, 28 and 40 by 4 feet. The first enlargement, accomplished from 1854 to 1862, was also similar to that of the Erie — 52½ and 70 by 7 feet. This branch did not share with the other three in the enlargement of 1896–8.

The dimensions of the present enlargement, or Barge canal improvement, are the same for all four branches of the system Briefly it may be stated that the law requires a channel at least 75 feet wide at the bottom and having 12 feet of water. In rivers and lakes the width is 200 feet, and 72 per cent of the length of the whole system is in river or lake channel. The locks are 328 feet long between gates, 45 feet wide, and have 12 feet of water over the sills.

These few pages cannot give any detailed account of route or of structures. The description might be extended indefinitely, for there is much of interest to be found throughout the 440 miles of construction and the 350 miles of intervening lakes or adjoining rivers. The accompanying map, however, will show the route of the Barge canal, as well as those of the earlier waterways, and something of the character of the work and the manner of prosecuting it may be seen in the appended photographs.

In general it may be stated that the Barge canal project is largely a river canalization scheme. Previous State canals have been chiefly independent or artificial channels, built in several instances on cross-country locations. Now, however, the route returns to the natural watercourses. The bed or the valley of the Mohawk is utilized from the Hudson to the old portage near Rome. Then Wood creek, Oneida lake, and Oneida, Seneca and Clyde rivers are used, carrying the channel to the western part of the state, where the streams run north and the alignment of the old channel is retained for the new canal. The other branches of the Barge canal occupy natural streams throughout most of their lengths.

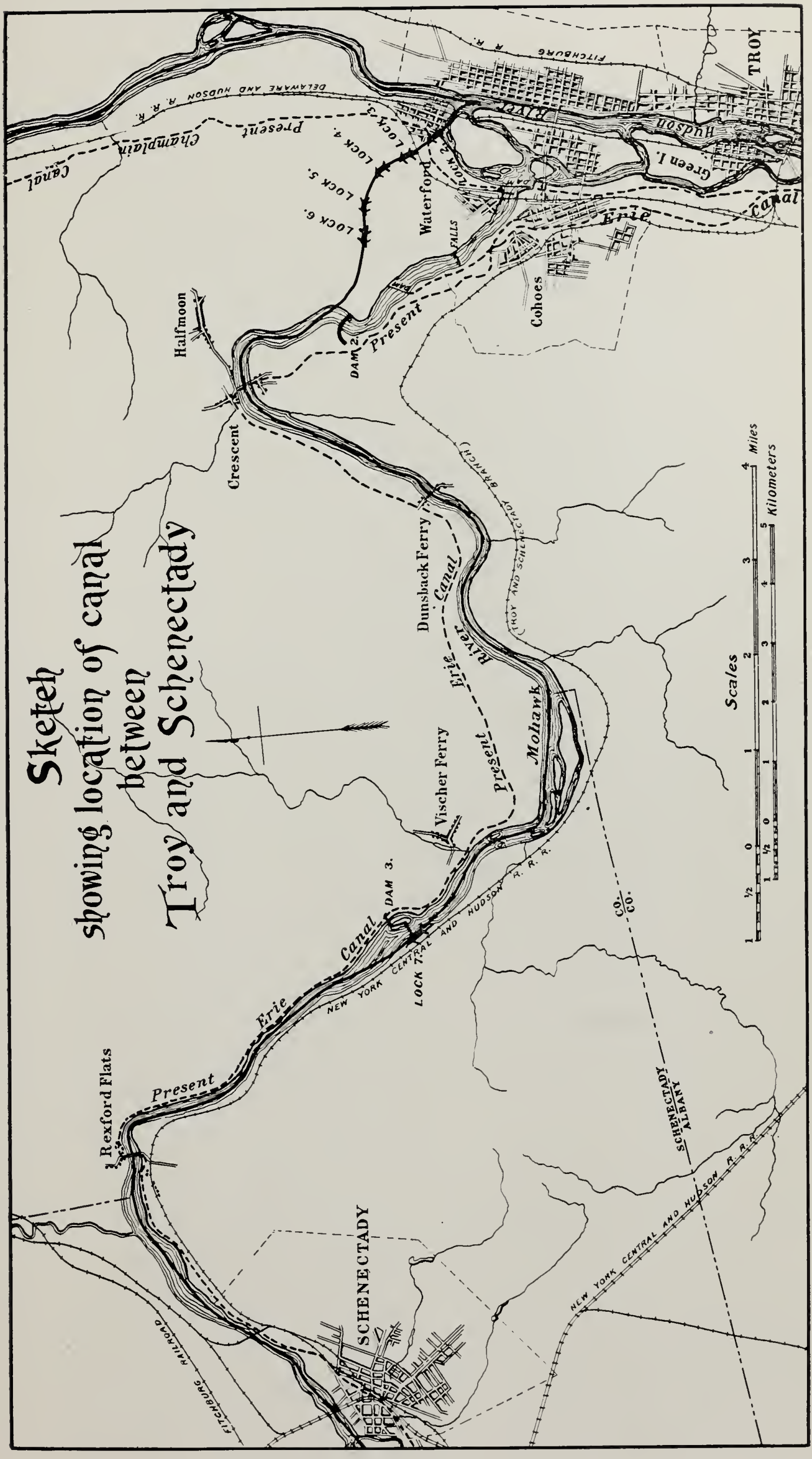
The accompanying statistical tabulation gives some of the leading facts concerning the Barge canal.

Statistics — Barge Canal.

As certain plans are still under consideration, the following figures are subject to change. All canals are meant, unless otherwise specified.

Erie branch, length of canal, not including Hudson and Niagara river termini	323.2	miles
Erie branch, number of locks	35	
Oneida lake, not included in above mileage, no improvement needed	about 19	miles
Spurs to Erie branch (Syracuse and Rochester harbors)	10.26	miles
Champlain branch, length of canal	61.5	miles
Champlain branch, number of locks	11	
Oswego branch, length of canal	22.8	miles

Oswego branch, number of locks	7	
Cayuga and Seneca branch, length of canal (including spurs at heads of lakes), approximate	27.3	miles
Cayuga and Seneca branch, number of locks	4	
Cayuga and Seneca lakes, portions needing no improvement and not included in above mileage	65	miles
Width of channel, land line, earth section, bottom, minimum	75	feet
Width of channel, land line, earth section, water-surface	123 to 171	feet
Width of channel, land line, rock section, bottom, minimum	94	feet
Width of channel, river line, bottom, generally	200	feet
Depth of channel, land line and minimum river line	12	feet
Locks, length between gates	328	feet
Locks, available length	310	feet
Locks, width of chamber	45	feet
Locks, depth of water on sills	12	feet
Dams, new	28	
Dams, old, with new crests	6	
Dams, old, used without change	5	
Bridges	199	
Boats, capacity, utilizing full lock width	about 3,000	tons
Boats, capacity, built for two to pass in most restricted channel and for two, traveling tandem, to be locked at one lockage	about 1,500	tons
Authorization of work (Erie, Champlain and Oswego canals)	Chap. 147, Laws of 1903	
Authorization of work (Cayuga and Seneca canal)	Chap. 391, Laws of 1909	
Appropriation (Erie, Champlain and Oswego canals)	$101,000,000	
Appropriation (Cayuga and Seneca canal)	7,000,000	
Construction work begun (Champlain canal)	April 24, 1905	
Construction work begun (Erie canal)	June 7, 1905	
Excavation, preliminary (1903) estimate, not including work for dams, bridges, highway, railway and stream changes and other small items (Erie, Champlain and Oswego canals)	132,225,800	cu. yds.
Excavation, contract plans (Erie, Champlain and Oswego canals), approximate	100,580,000	cu. yds.
Excavation, contract plans (Cayuga and Seneca canal), approximate	9,100,000	cu. yds.
Concrete, preliminary (1903) estimate (Erie, Champlain and Oswego canals)	3,243,100	cu. yds.
Concrete, contract plans (Erie, Champlain and Oswego canals), approximate	2,800,000	cu. yds.
Concrete, contract plans (Cayuga and Seneca canal), approximate	150,000	cu. yds.
Length under contract, May 1, 1912	423.8	miles
Value of work under contract, May 1, 1912 (contract prices, including alterations)	$75,407,135	
Value of work done on contracts to May 1, 1912	$44,206,323	


Sketch
showing location of canal
between
Troy and Schenectady
TROY
Hudson River
Green I.
Erie Canal
Champlain Canal
Present
DELAWARE AND HUDSON R. R. R.
FITCHBURG R. R.
LOCK 3.
LOCK 4.
LOCK 5.
LOCK 6.
LOCK 2.
DAM
FALLS
Waterford
Cohoes
Halfmoon
DAM 2
Present
Crescent
Dunsback Ferry
Present Erie Canal
Mohawk River
TROY AND SCHENECTADY BRANCH
Vischer Ferry
DAM 3.
LOCK 7
Present Erie Canal
NEW YORK CENTRAL AND HUDSON R. R.
Rexford Flats
SCHENECTADY
FITCHBURG RAILROAD
SCHENECTADY CO.
ALBANY CO.
NEW YORK CENTRAL AND HUDSON R. R.
Scales
1/2 0 1 2 3 4 Miles
1 1/2 0 1 2 3 4 5 Kilometers

Eastern Portion of Barge Canal.

At its eastern terminus the Erie branch of the Barge canal passes through two and a half miles of land line, in which are located five locks of high lift; then, going west, the Mohawk river is canalized. This canalization is accomplished to Schenectady by two fixed dams, one near Crescent and one at Vischer's Ferry. Contracts Nos. 2 and 11 cover the land line, while the dams are a part of contract No. 14.

CONTRACT NO. 2.

Description: For excavating the canal and protecting its sides from the Mohawk river at Waterford to a point about one-fourth mile west of lock No. 3, the construction of locks Nos. 2 and 3 and appertaining structures and other incidental details.

Length of contract, .91 miles.

Contract price, $852,330. Engineer's estimate, $1,022,640.

Total excavation, 576,429 cu. yds. Contract price, 40 cents per cu. yd.

Total concrete, 108,344 cu. yds. Contract price, $5.50 per cu. yd.

Lock No. 2:

Lift of lock, 34½ feet.
Height of wall, 50½ feet.
Amount of concrete, 39,540 cu. yds.

Lock No. 3:

Lift of lock, 34½ feet.
Height of wall, 50½ feet.
Amount of concrete, 30,920 cu. yds.

CONTRACT NO. 11.

Description: For excavating the canal and protecting its sides, between the west end of contract No. 2 and the Mohawk river, including the construction of locks Nos. 4, 5 and 6 and appertaining structures, a highway, masonry for a guard-gate, bridge abutments and other incidental details.

Length of contract, 1.6 miles.

Contract price $1,359,475. Engineer's estimate, $1,671,385.

Total excavation, 801,750 cu. yds. Contract price, 51 cents per cu. yd.

Total concrete, 163,160 cu. yds. Contract price, $5 per cu. yd.

Lift of lock No. 4, 34½ feet.
Lift of lock No. 6, 33 feet.
Lift of lock No. 5, 32½ feet.
Height of walls, 50½ feet.

PART OF CONTRACT NO. 14.

Crescent Dam:

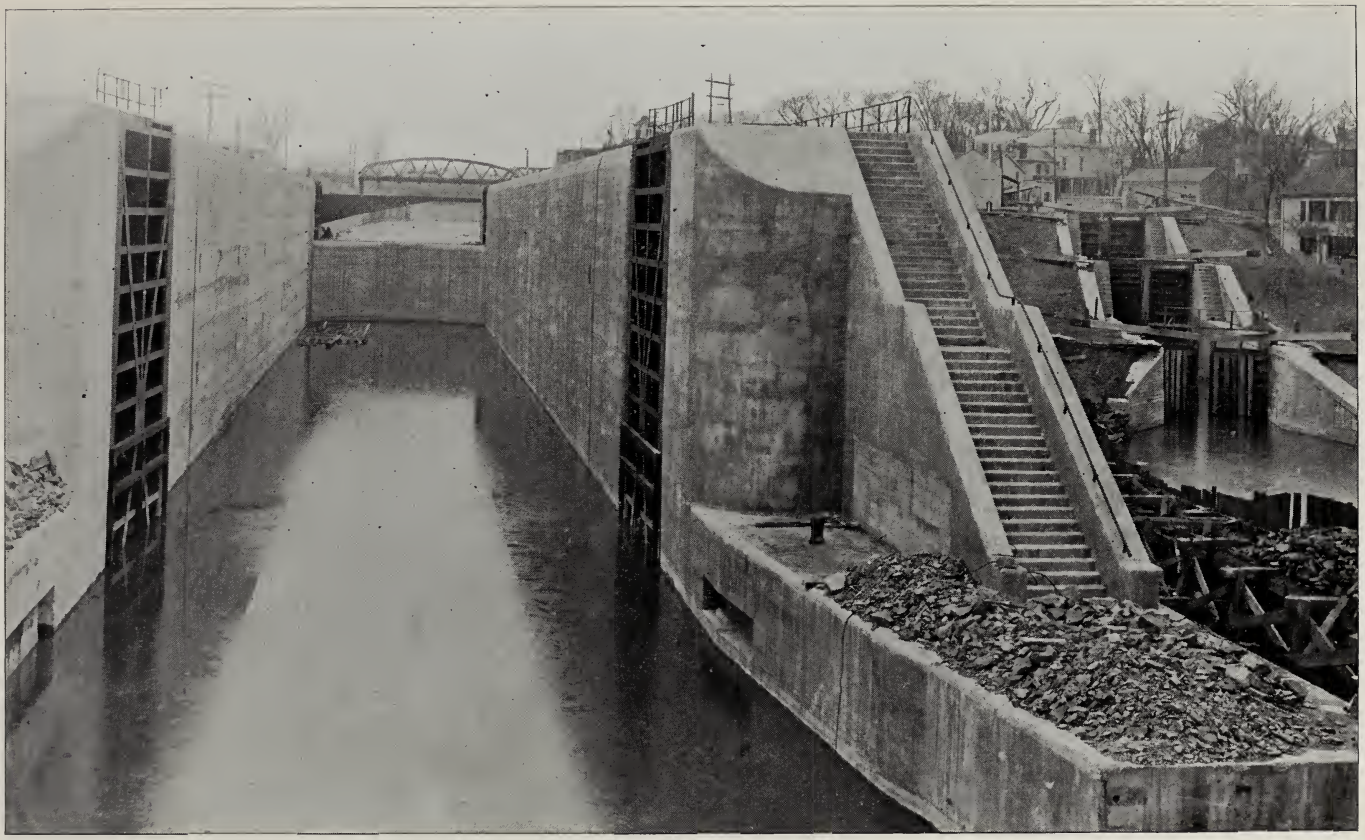
Contract price, $466,438.78. Engineer's estimate, $461,402.75.
Total length, 1,922 feet.
Radius, 700 feet.
Height of crest above top of apron, 39 feet.
Width on base, 42 feet, ½ inch.
Width on top, 11 feet, 5 inches.
Pool raised about 27 feet.
Width of apron, 40 feet.
Total concrete, 54,360 cu. yds. Contract price, $7.50 per cu. yd.

Vischer's Ferry Dam:

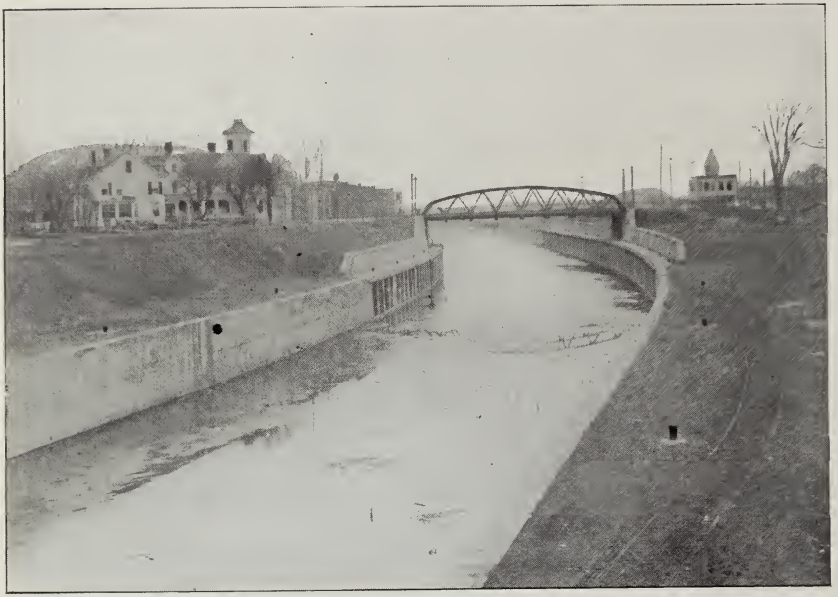
Contract price, $518,149.65. Engineer's estimate, $511,053.60.
Total length nearly 2,000 feet.
Width on base, 40 feet, 6½ inches.
Width on top, 11 feet, 5 inches.
Height of crest above top of apron, 36 feet.
Width of apron, 38 feet.
Total concrete, 58,750 cu. yds. Contract price, $7.50 per cu. yd.

Lock No. 7:

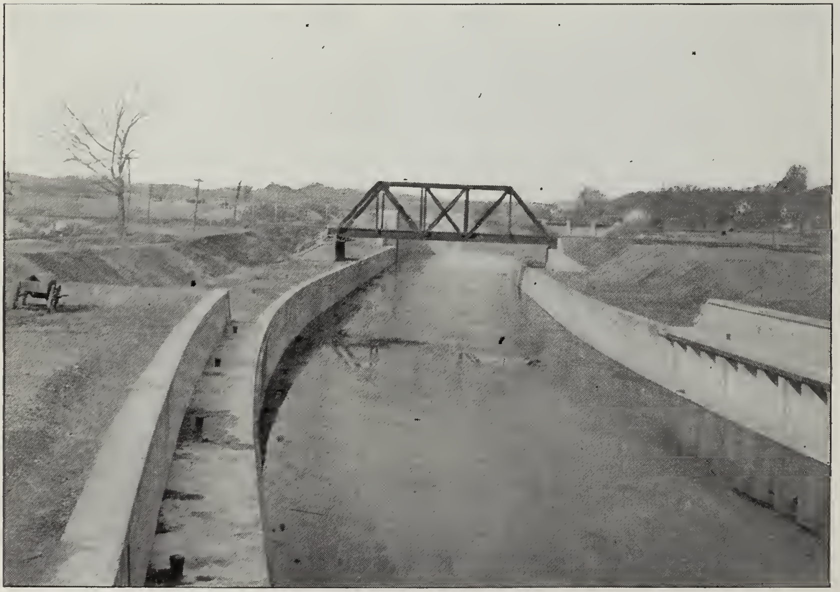
Lift of lock, 26 feet.
Height of wall, 44 feet.
Amount of concrete, 31,202 cu. yds. Contract price, $7.50 per cu. yd.



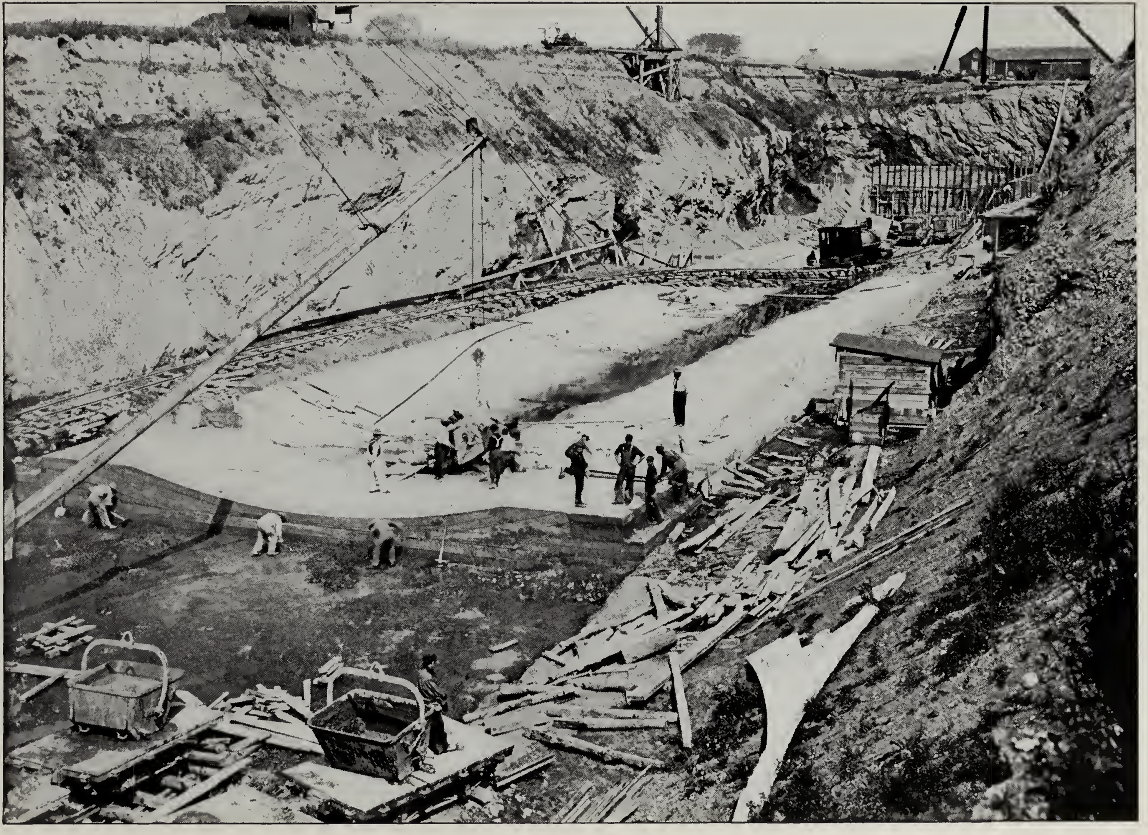
Lock No. 2, at Waterford, the eastern terminus of the Erie canal. A flight of three locks of present canal dimensions is seen at the right. This is the first of a series of five high lift locks, located within about a mile and a half. The combined lifts of the five locks total 169 feet.



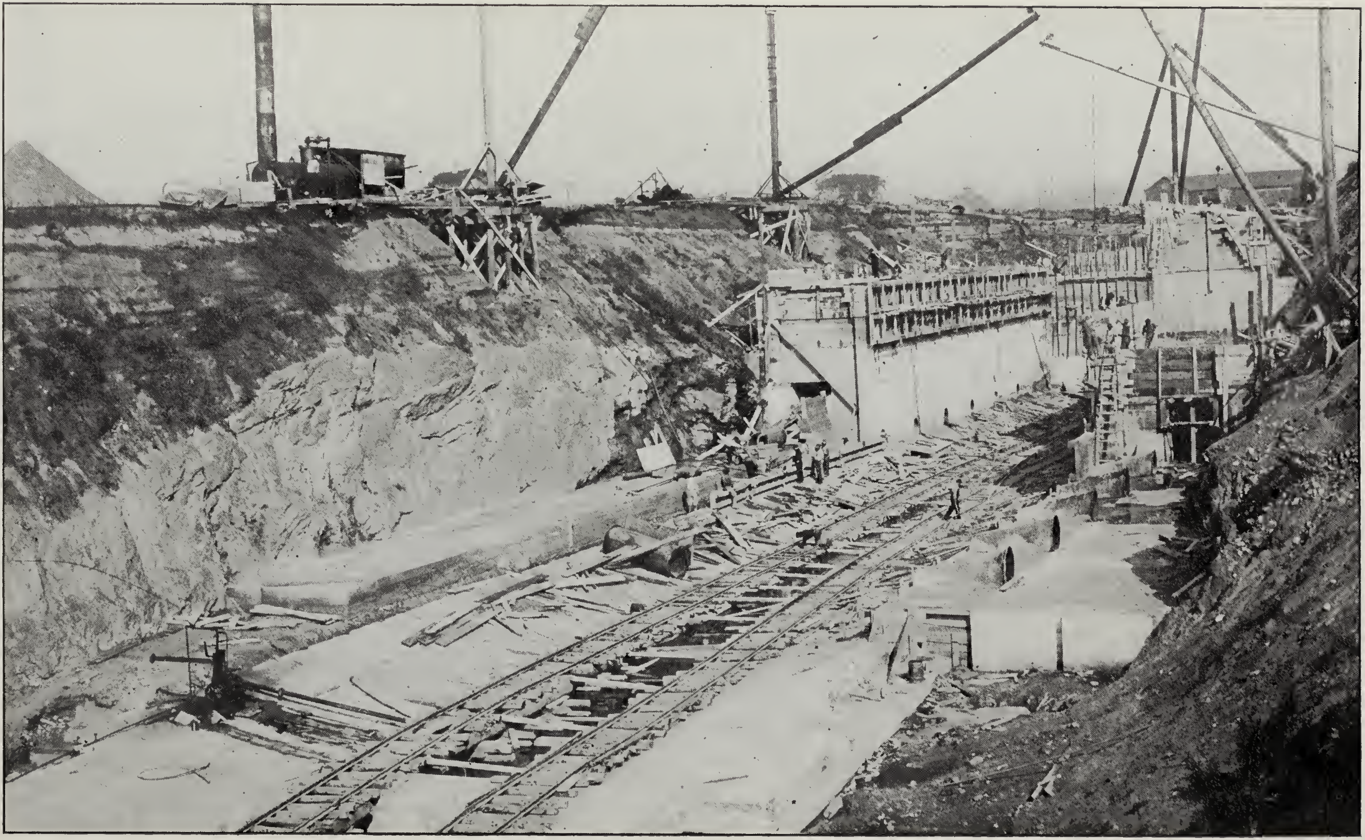
View of completed canal, looking towards lock No. 2, at Waterford.



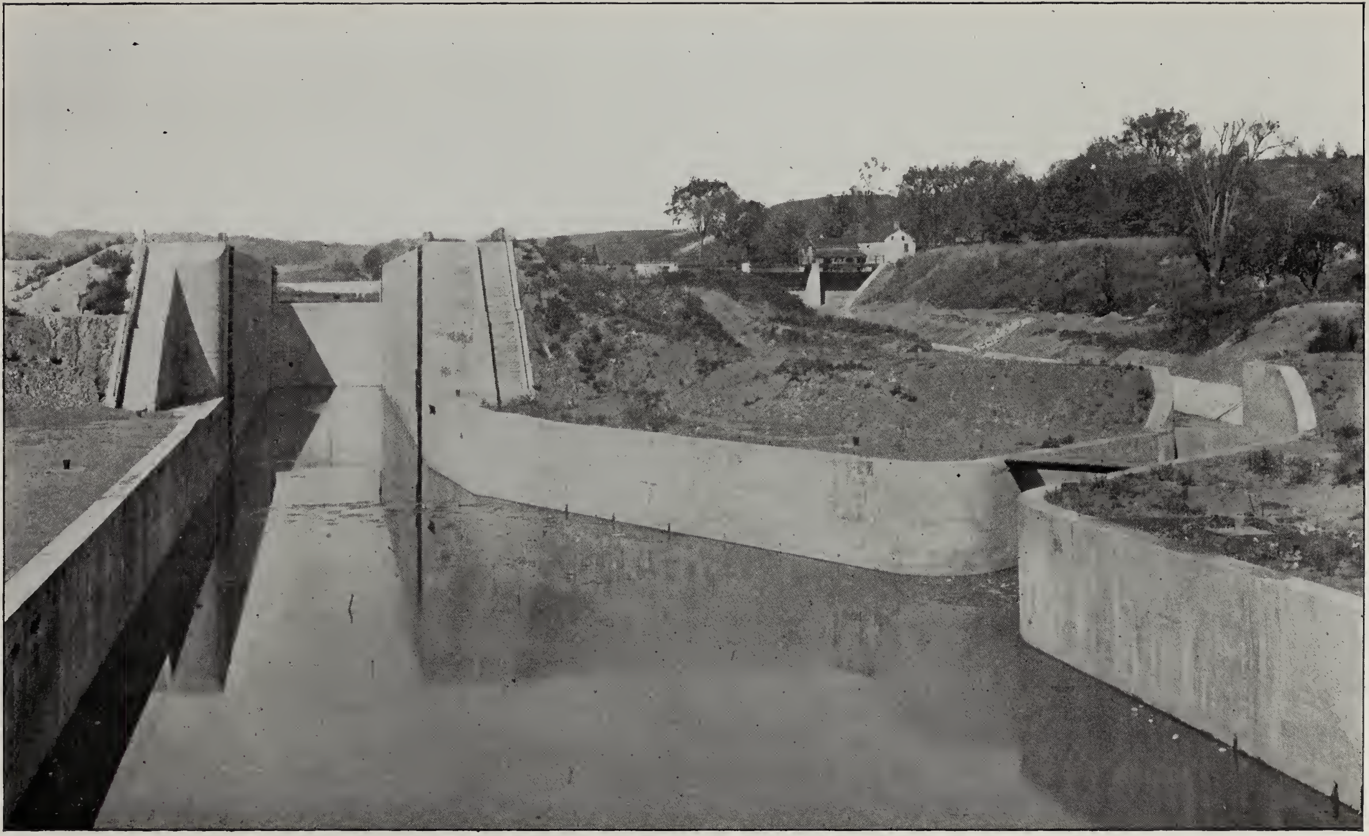
View of completed canal, looking towards lock No. 3, at Waterford.



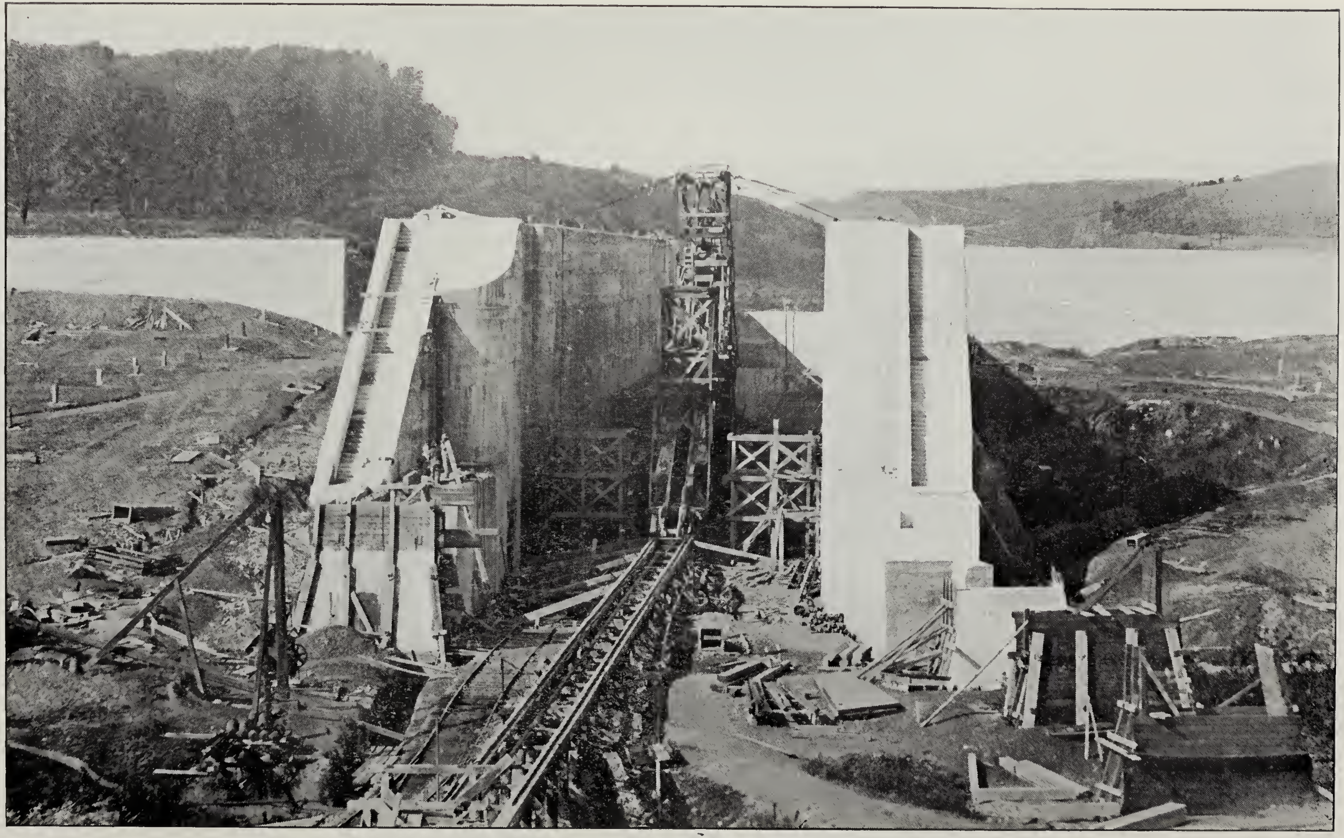
View of lock No. 3, near Waterford, showing progress in constructing the concrete floor on a rock foundation.



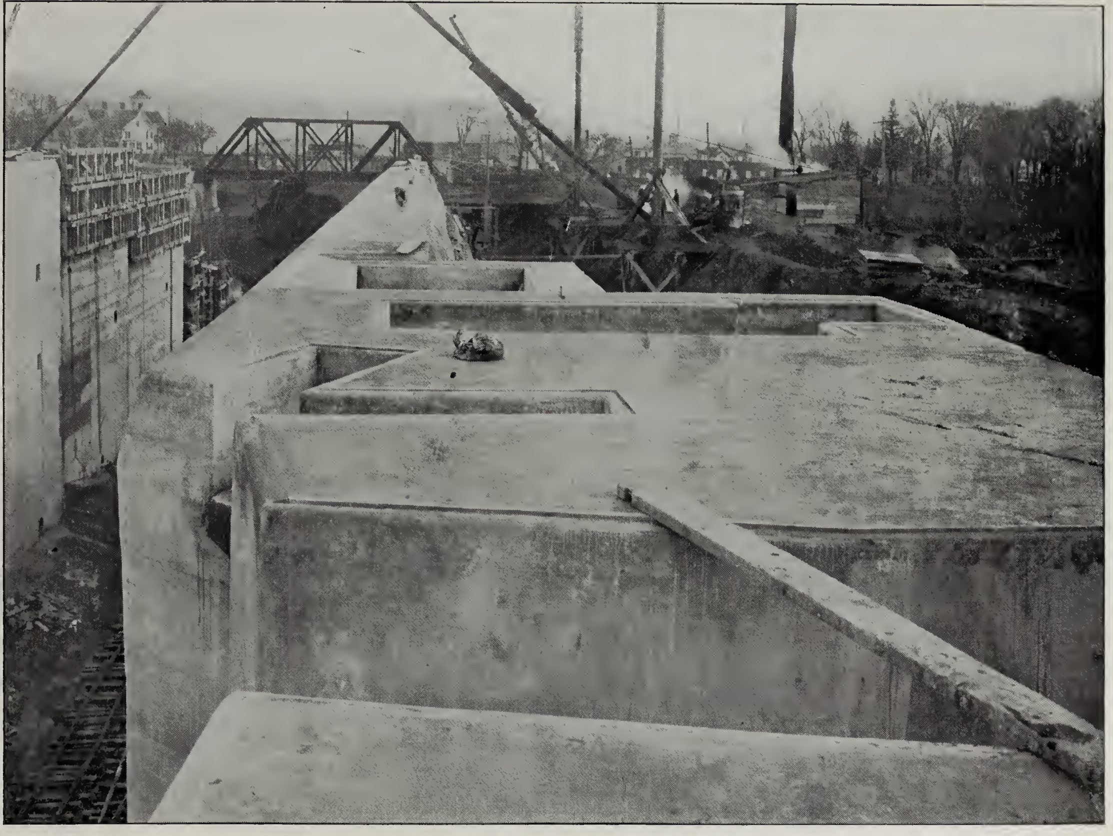
View of lock No. 3, near Waterford, showing progress in constructing side and head walls.



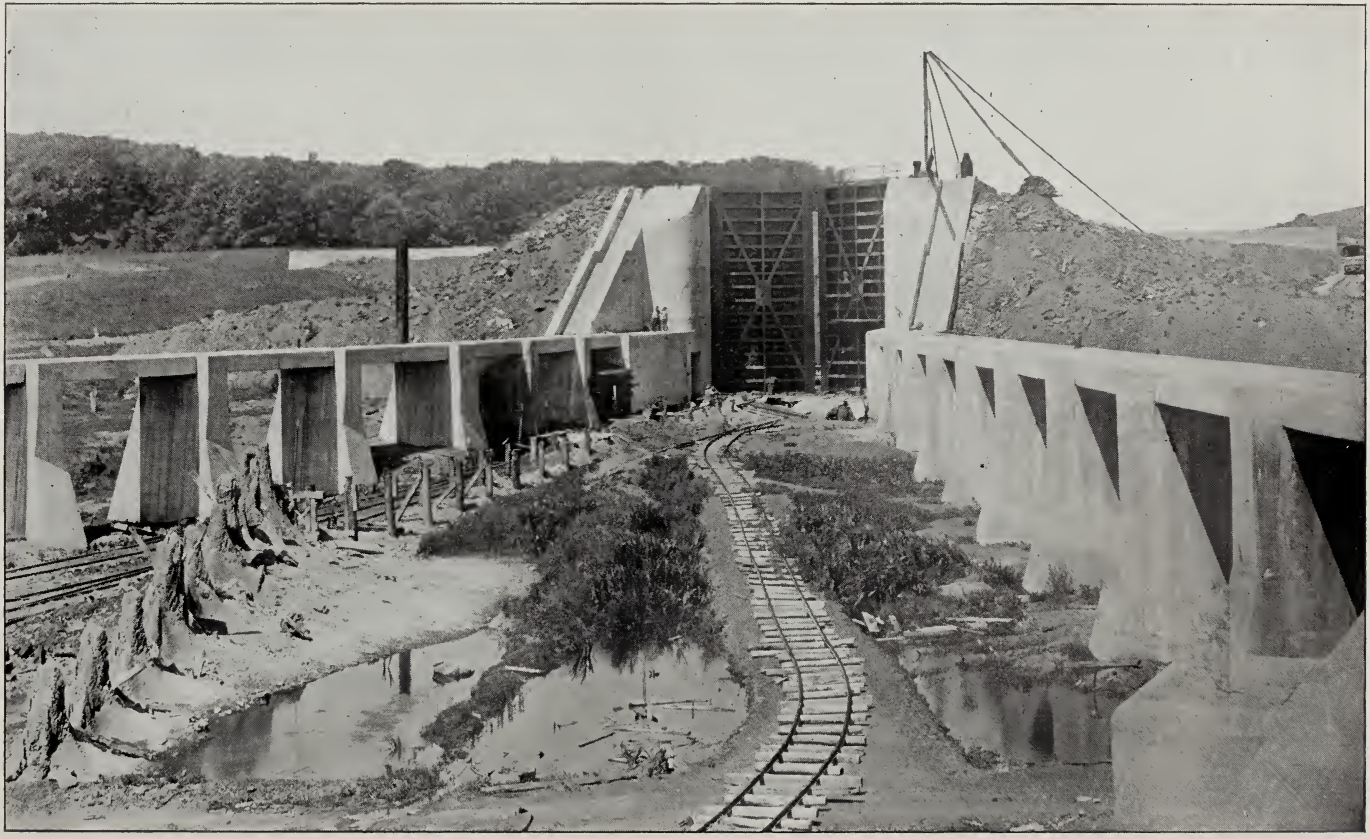
Completed lock No. 3 and by-pass, near Waterford.



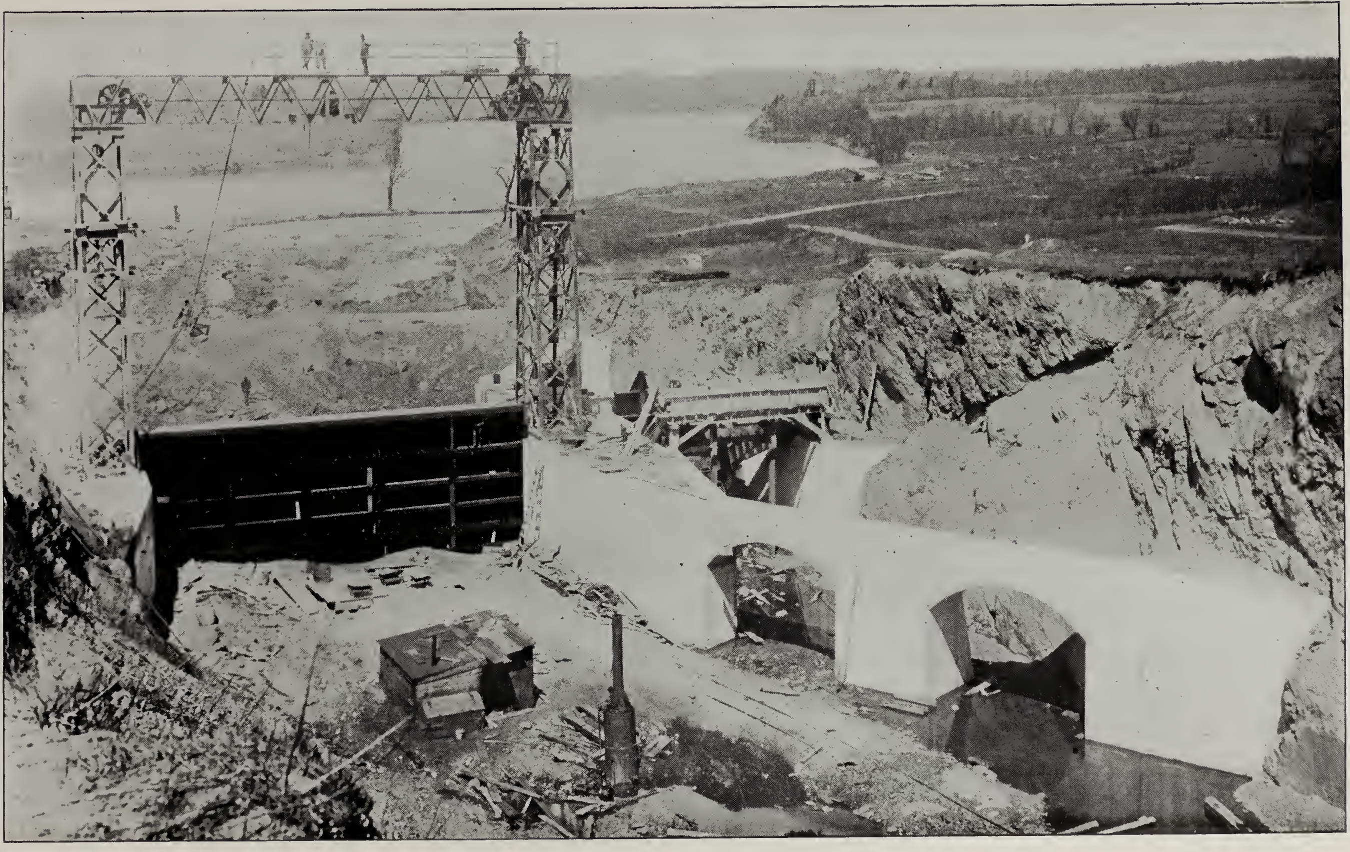
Lock No. 5, near Waterford, in a nearly completed state. The machine within the chamber is part of a belt conveyor used for carrying mixed concrete about 700 feet from the mixer to the lock. At the head is shown a core wall, marking the confines of a pool.



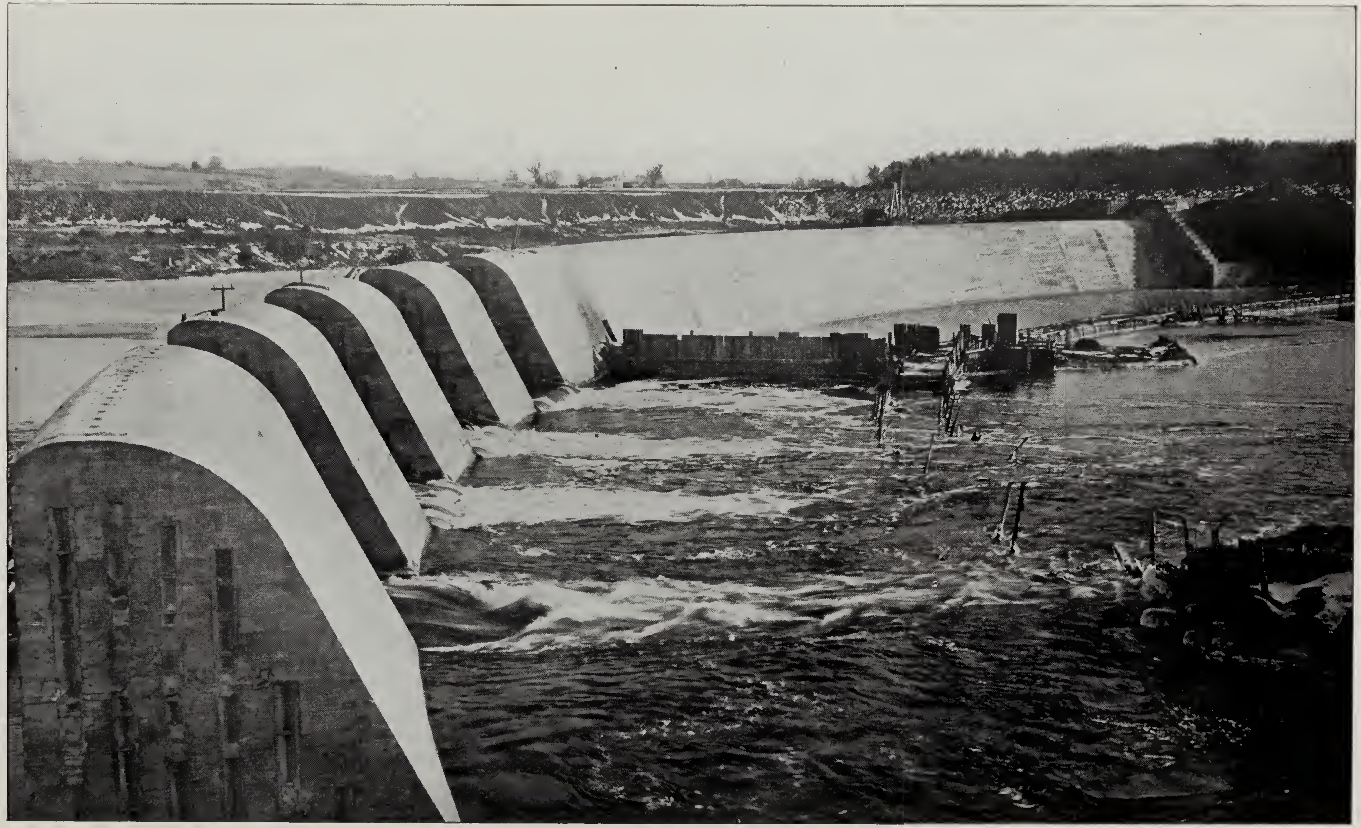
Top of a lock wall near the upper gate. The opening in the foreground is to receive the machinery for operating the gate; the second opening is for the gate anchorage; the third, for valves and their operating machinery; the fourth to contain a capstan.



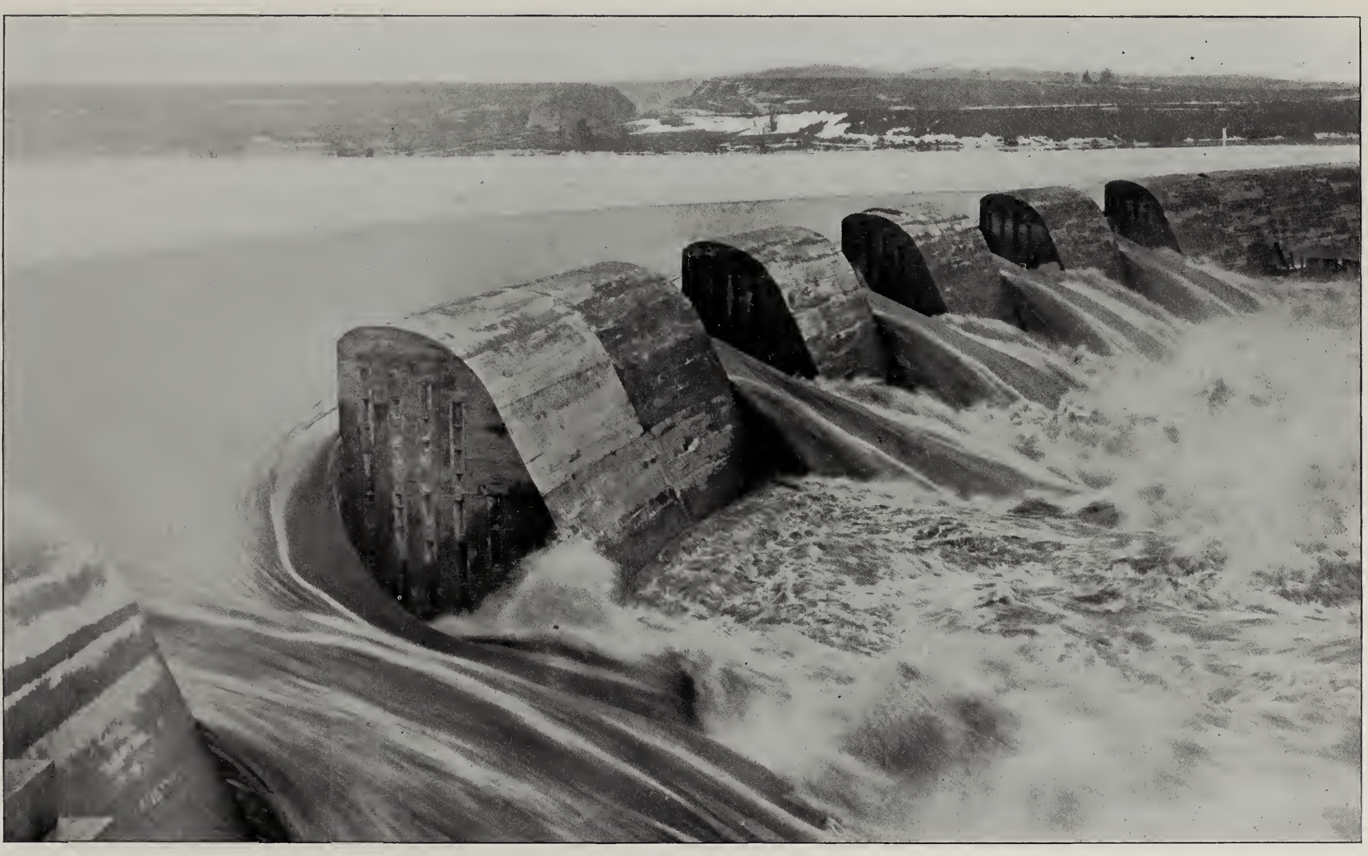
Concrete docking between two of the locks near Waterford. The locks in this series are so close together that pools are required, and the docking borders the channel through the pool.



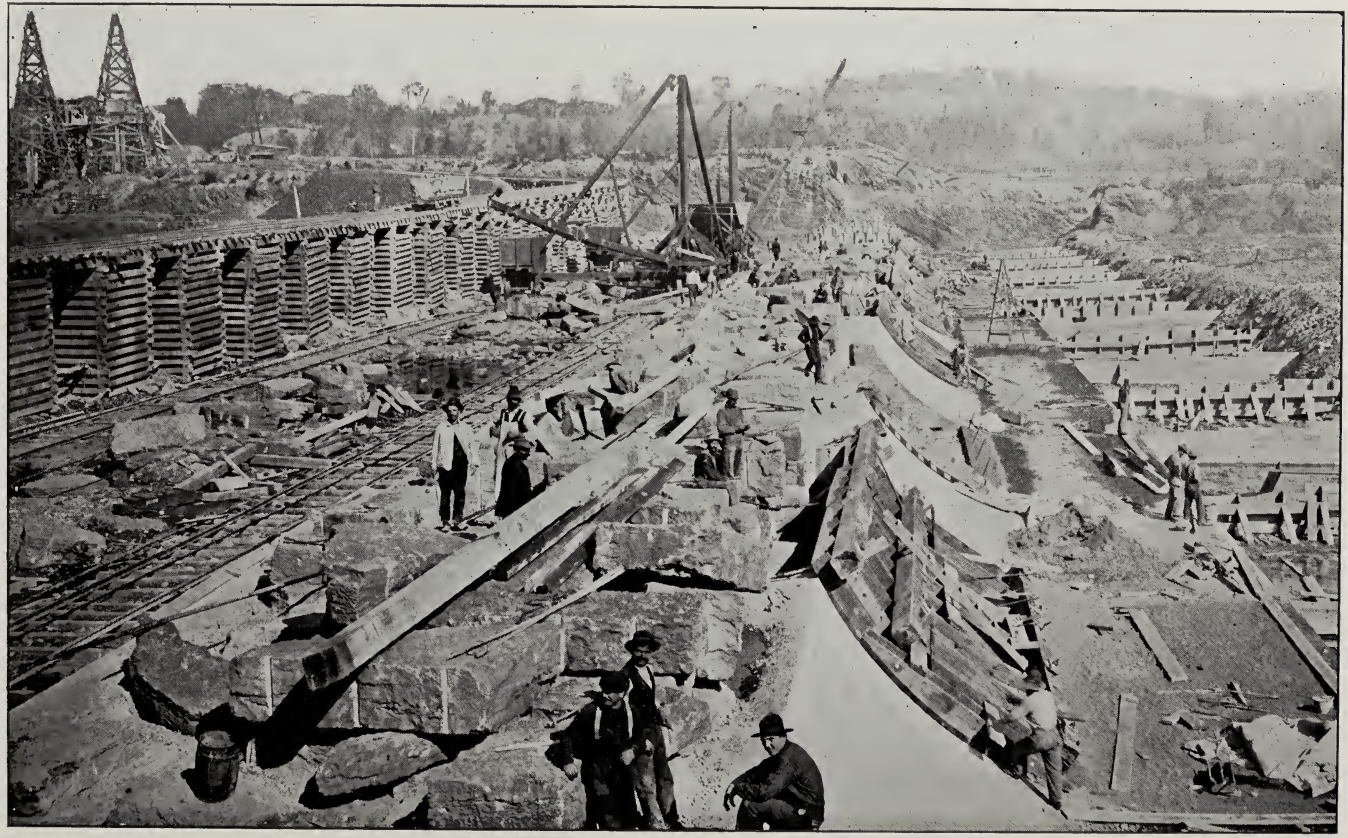
Guard-gate and by-pass under construction at the head of the land line between Hudson and Mohawk rivers. The entrance into the Mohawk just above Crescent dam is also shown.



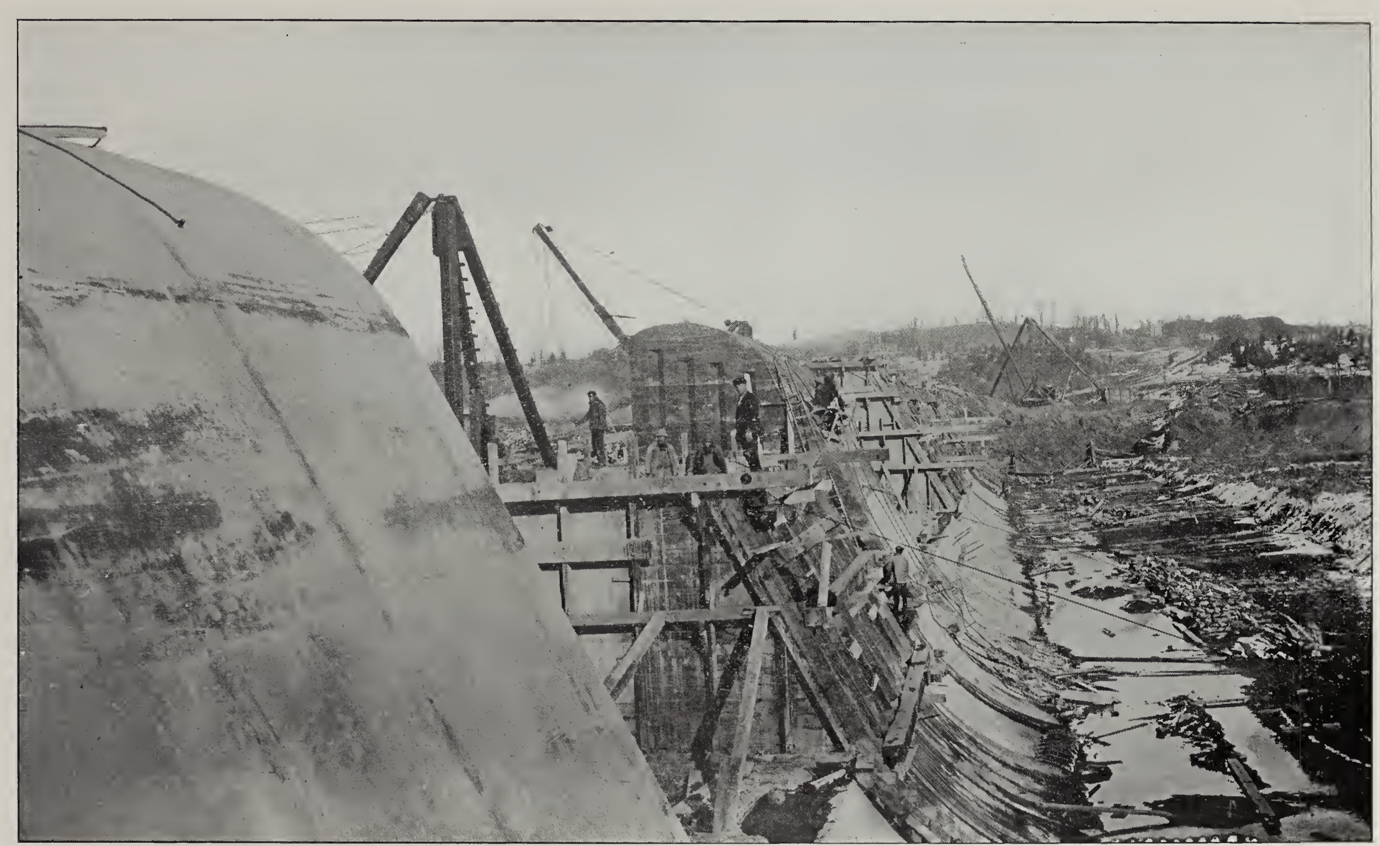
Eastern portion of the dam at the foot of Mohawk river navigation, known as Crescent dam, taking its name from a near-by hamlet.



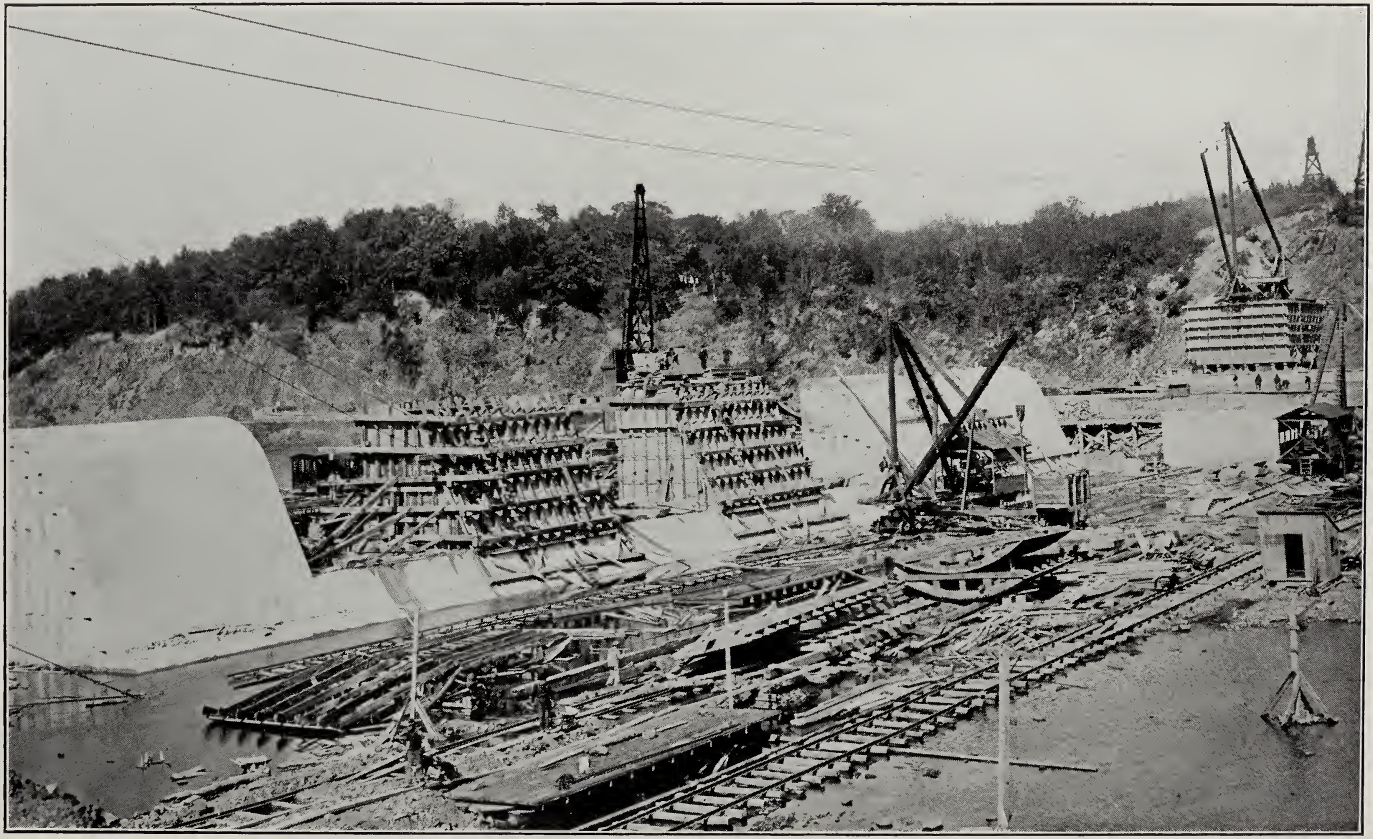
Eastern portion of the Crescent dam, with completed alternate sections, during spring flood. The cut for the canal channel is seen in the farther bank.



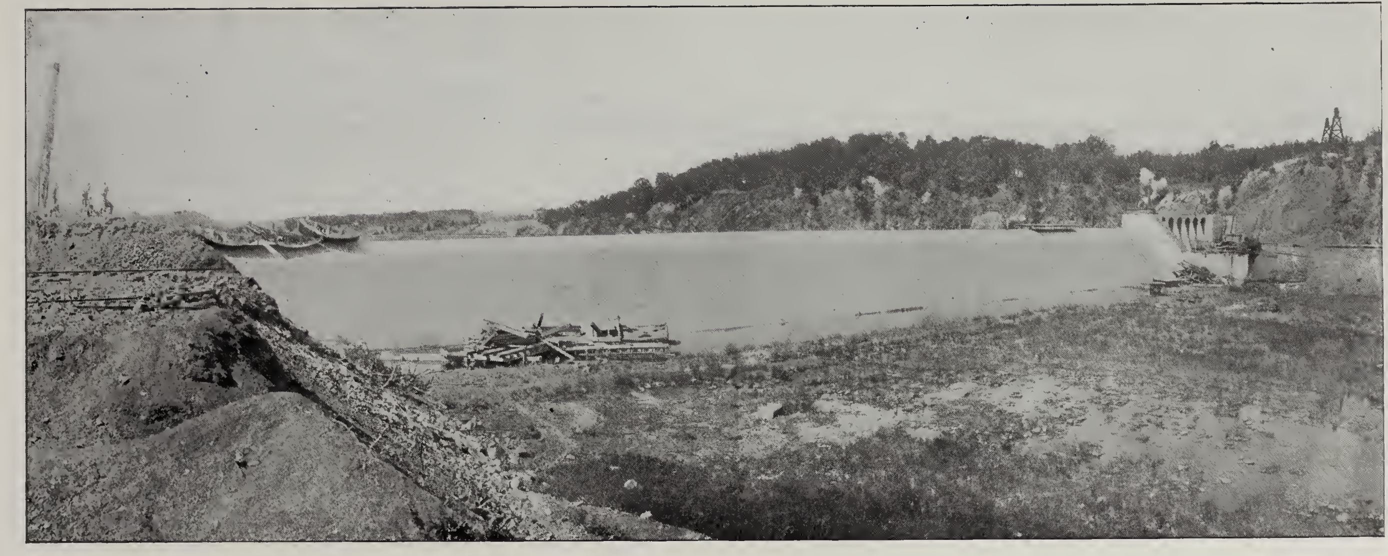
Southern portion of the dam at Vischer's Ferry during early stages of construction. Stone for cyclopean masonry is shown.



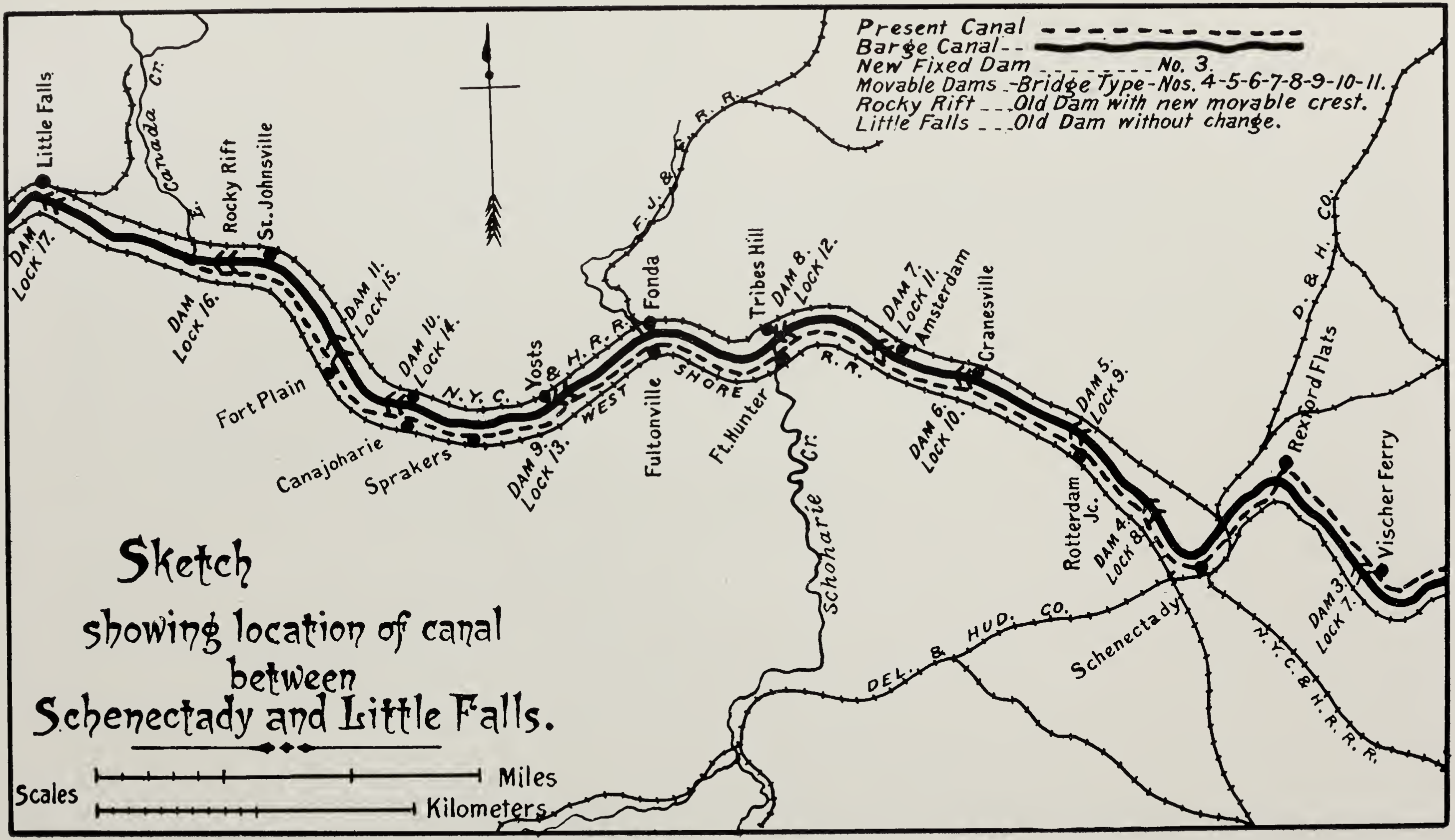
View of the southern portion of Vischer's Ferry dam, showing alternate sections nearing completion.



Northern portion of Vischer's Ferry dam during construction.



View of completed northern portion of Vischer's Ferry dam, showing also the head gates at the farther end.


Sketch showing location of canal between Schenectady and Little Falls.

Movable Dams of the Lower Mohawk.

Between Schenectady and Little Falls there are located eight movable dams. Geologists tell us that in ancient times the Mohawk valley carried a stream of much larger proportions than at present, since it drained a vast inland lake that covered much of the northern part of our country. Although it is thus unlike the valleys of most of the streams in the western and southern parts of the country (in which heretofore most of the movable dams in this country have been built by the United States Government), having a considerably greater proportionate area for passing its present-day floods, the adjacent territory is so highly developed and so populous, that any change which might raise the height of floods would be disastrous. Accordingly movable dams were planned. They are of the bridge type, with Boulé gates. The upright frames are 15 feet apart. The gates are 30 feet wide and are placed in tiers.

Dam No. 4, at Scotia:
Length between abutments, 530 feet.
Openings, two of 150 feet and one of 210 feet.
Width of base, 70 feet.
Depth on sill at upper pool, 19 feet.
Difference between upper and lower pools, 14 feet.

Dam No. 5, at Rotterdam:
Length between abutments, 530 feet.
Openings, two of 150 feet and one of 210 feet.
Width of base, 80 feet.
Depth on sill at upper pool, 20 feet.
Difference between upper and lower pools, 15 feet.

Dam No. 6, at Cranesville:
Length between abutments, 500 feet.
Openings, two of 150 feet and one of 180 feet.
Width of base, 80 feet.
Depth on sill at upper pool, 20 feet.
Difference between upper and lower pools, 15 feet.

Dam No. 7, at Amsterdam:
Length between abutments, 590 feet.
Openings, two of 180 feet and one of 210 feet.
Width of base, 62½ feet.
Depth on sill at upper pool, 20 feet.
Difference between upper and lower pools, 12 feet.

Dam No. 8, at Tribes Hill:
Length between abutments, 500 feet.
Openings, two of 240 feet.
Width of base, 60 feet.
Depth on sill at upper pool, 16 feet.
Difference between upper and lower pools, 11 feet.

Dam No. 9, at Yosts:

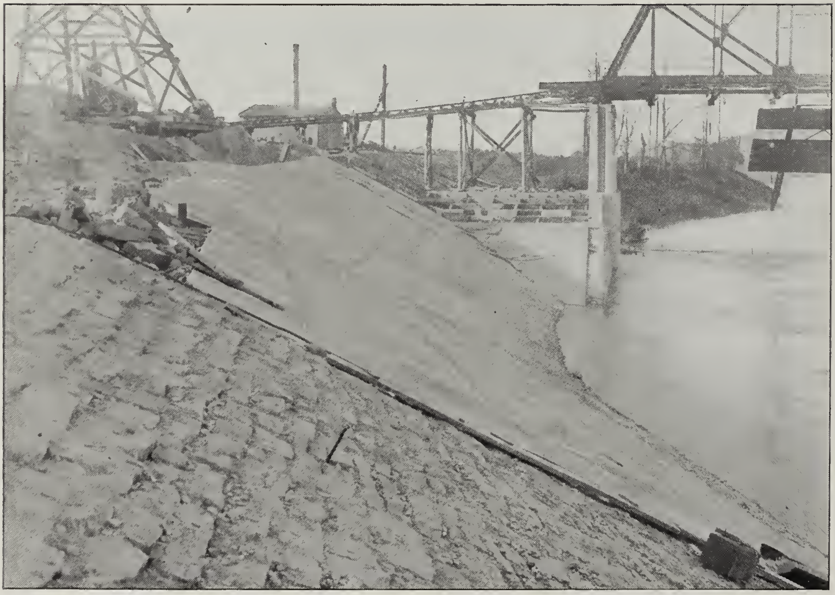
Length between abutments, 370 feet.
Openings, two of 180 feet.
Width of base, 52 feet.
Depth on sill at upper pool, 18 feet.
Difference between upper and lower pools, 8 feet.

Dam No. 10, at Canajoharie:

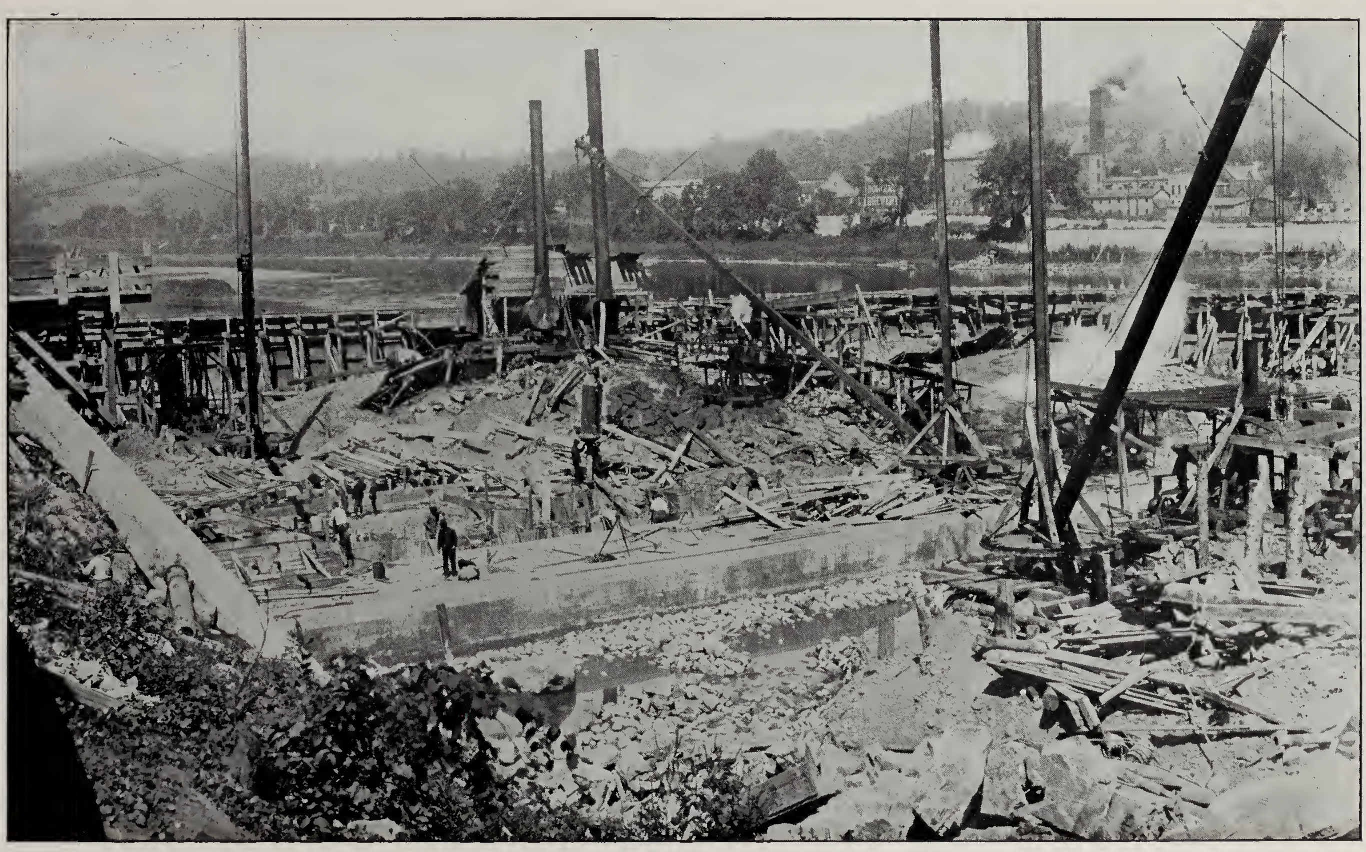
Length between abutments, 430 feet.
Openings, two of 210 feet.
Width of base, 52 feet.
Depth on sill at upper pool, 16 feet.
Difference between upper and lower pools, 8 feet.

Dam No. 11, at Fort Plain:

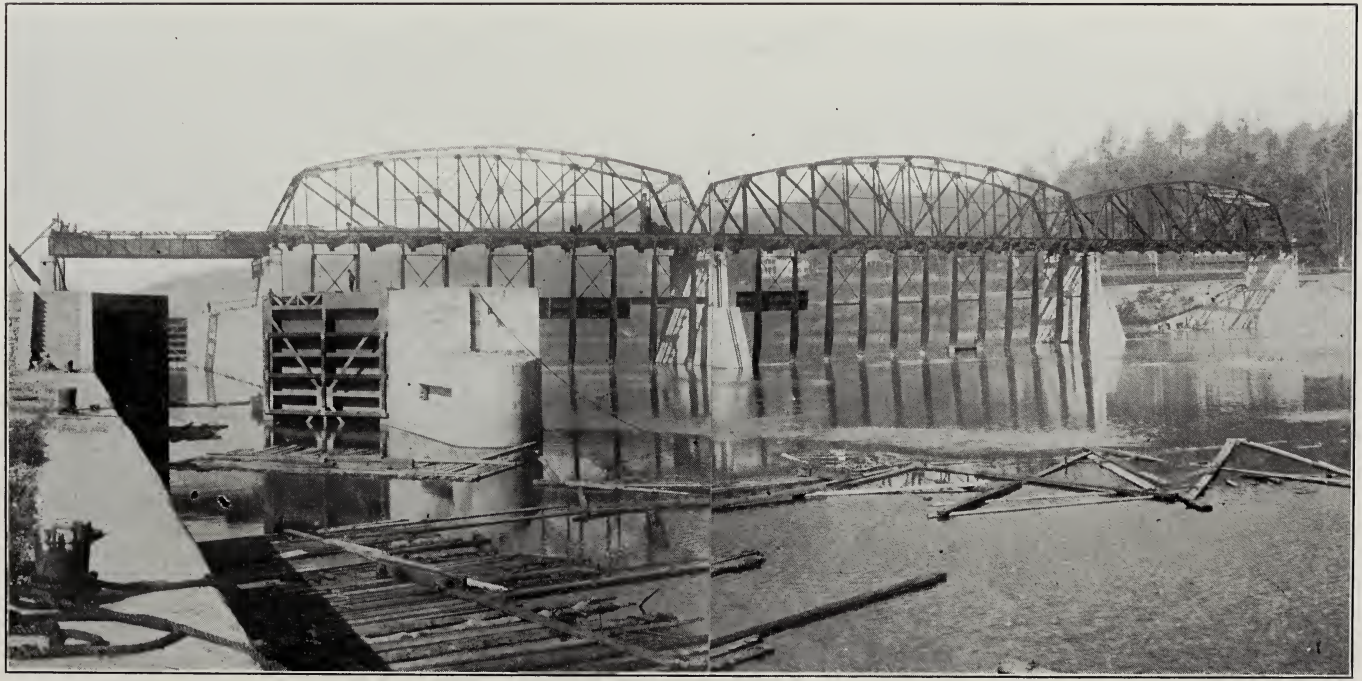
Length between abutments, 430 feet.
Openings, two of 210 feet.
Width of base, 30 and 34 feet.
Depth on sill at upper pool, 18 feet.
Difference between upper and lower pools, 8 feet.



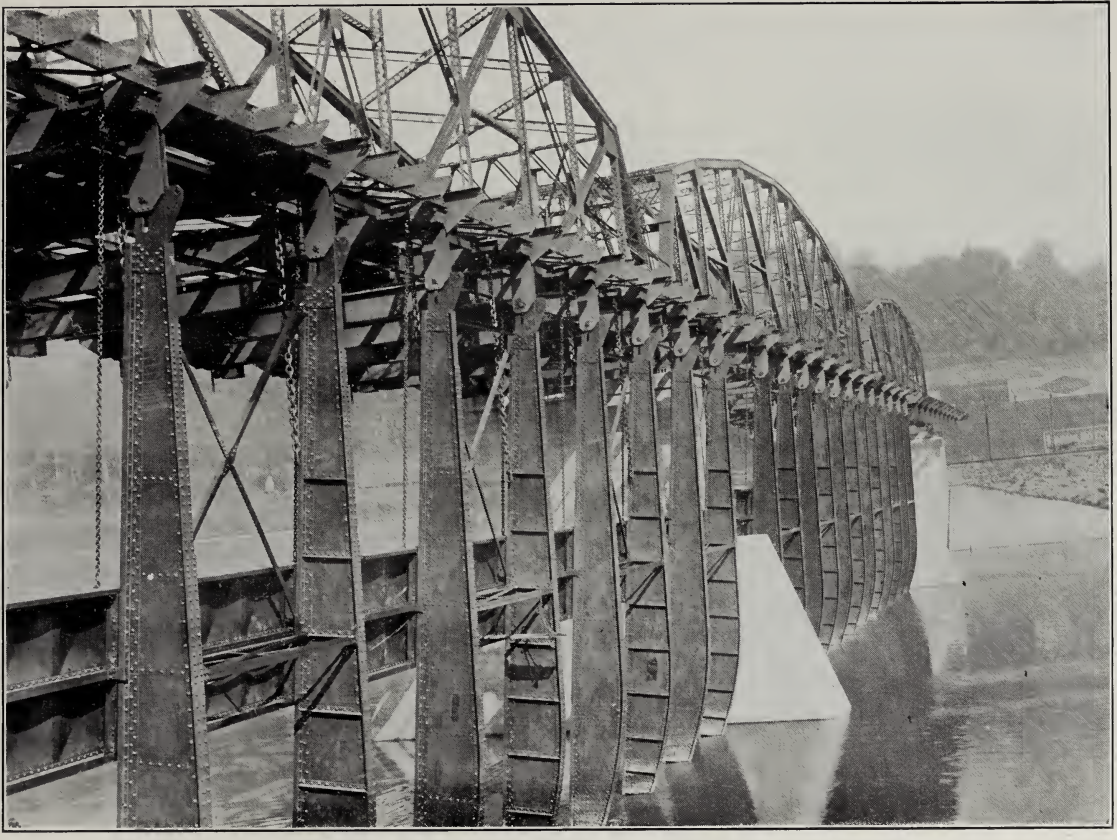
Paving consisting of concrete slabs, for shore protection at the movable dam at Rotterdam.



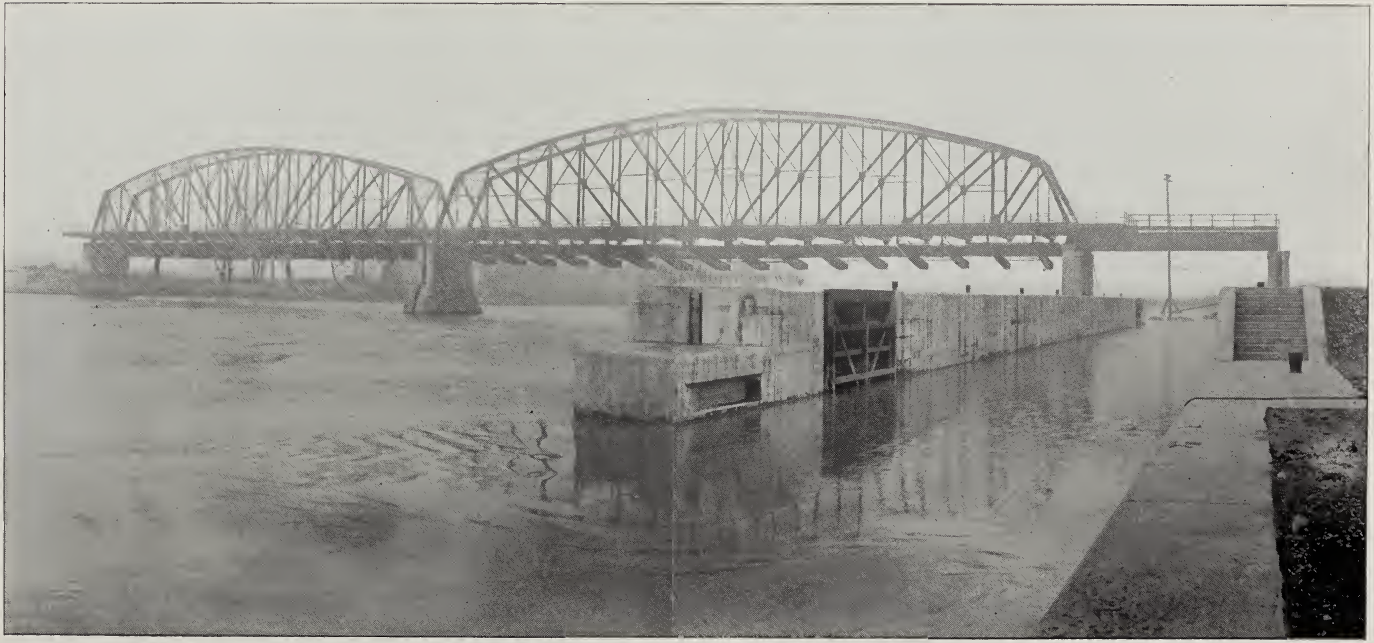
Construction of the concrete sill of the movable dam of bridge type at Amsterdam.



View showing progress in constructing movable dam of bridge type at Cranesville. The upright gate frames are seen suspended beneath two bridge spans and a part of one tier of gates is shown.



Near-by view of the movable dam at Cranesville, showing details of construction.



General view of the lock and movable dam of bridge type at Tribes Hill. The gates and uprights are all raised, ready for winter and flood conditions.

Construction at Little Falls.

A noteworthy structure at Little Falls is the new lock, which has a lift of 40½ feet. The lower gate of this lock is of the lift type — the only lift lock gate on the canal. The lock has also another distinctive feature — a pool beside it for conserving water by using a part of a lockful a second time. The work at Little Falls is known as contract No. 31.

CONTRACT NO. 31.

Description: For improving the Erie canal at Little Falls, modifying the dam and constructing guard-gates at Rocky Rift.

Length of contract, 1.01 miles.

Contract price, $829,770.43. Engineer's estimate, $813,800.

Total excavation, 244,000 cu. yds. Contract price, $1.25 per cu. yd.

Total concrete, 58,830 cu. yds. Contract price, $6.50 per cu. yd.

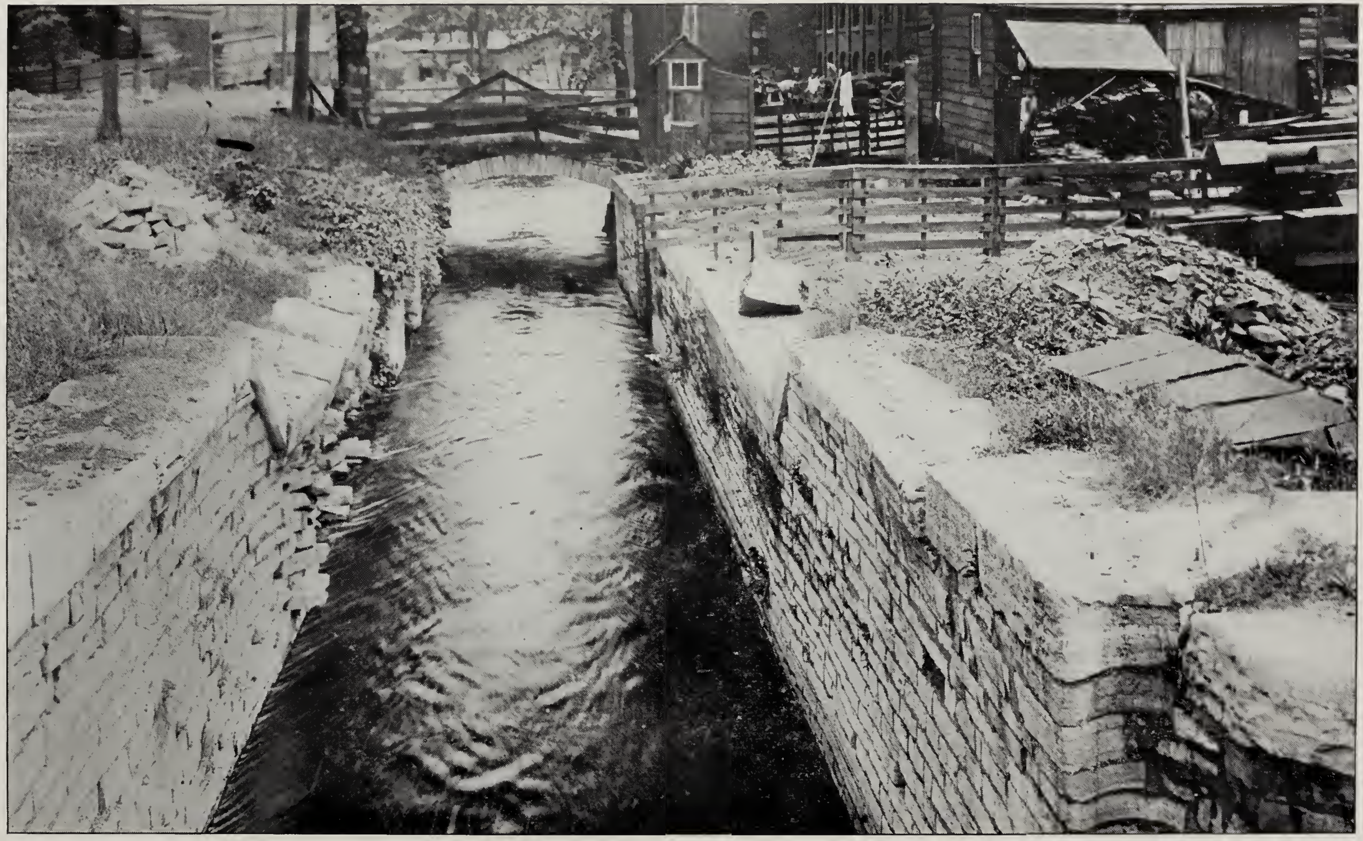
Lock No. 17:

Lift, 40½ feet.

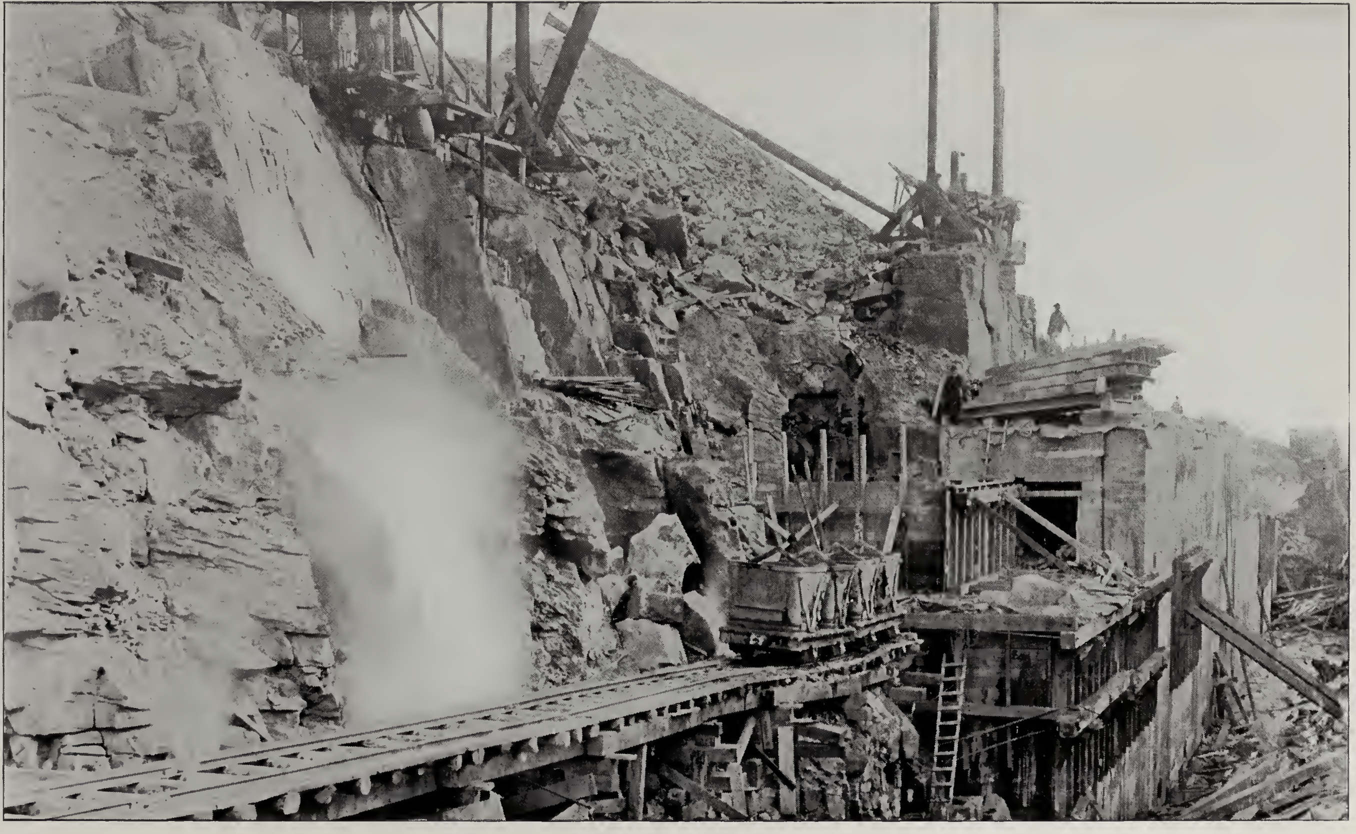
Height of wall, 61 feet.

Amount of concrete, 31,420 cu. yds.

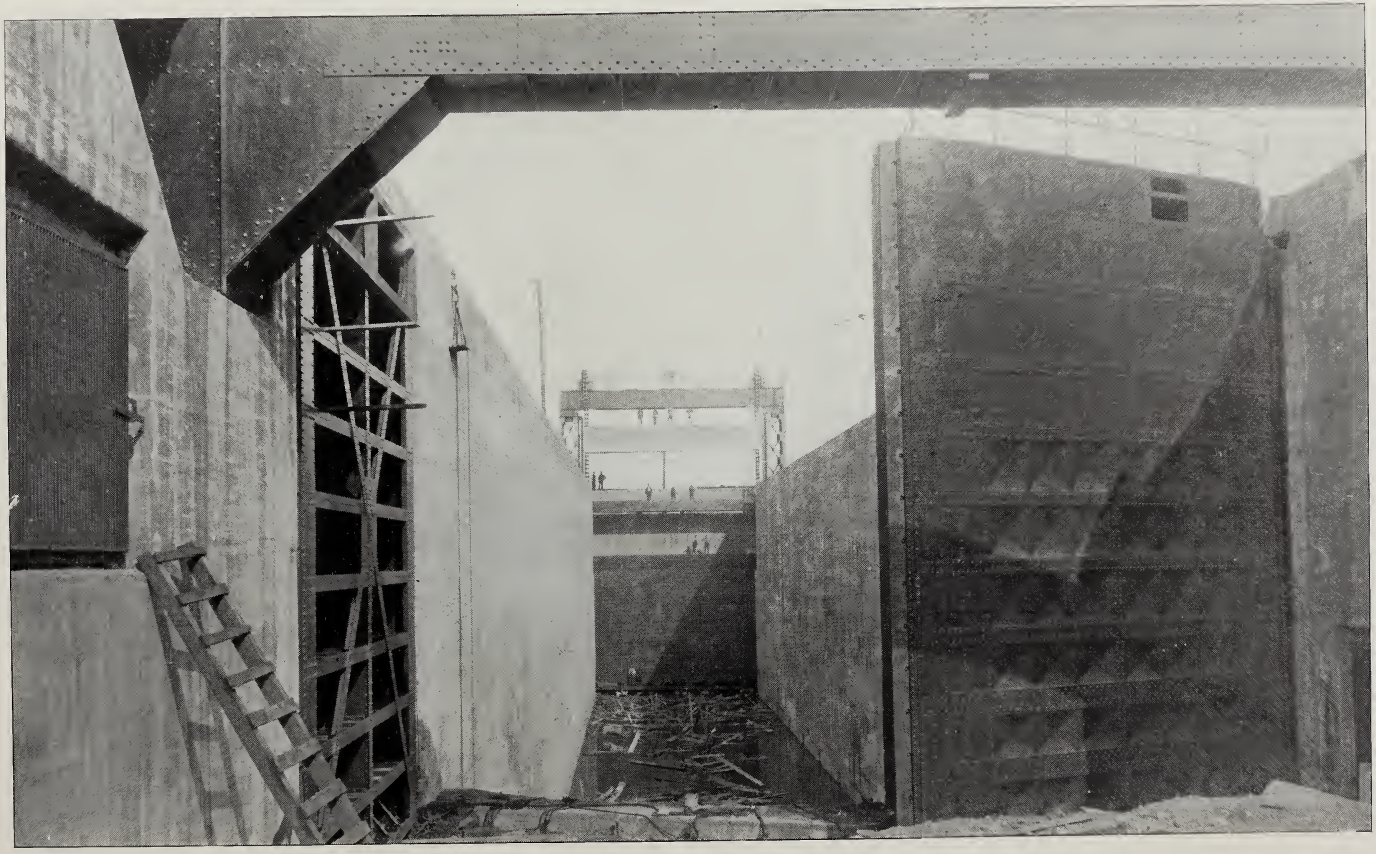
There are three other structures at Little Falls that are noteworthy because of their historical value. The first company to undertake internal improvements in the state did its first work here, beginning in 1793. A lock — 74 by 12 feet — and a stone arch bridge built by this company are still standing. The third structure is an aqueduct which carried the first State-built canal across the river.



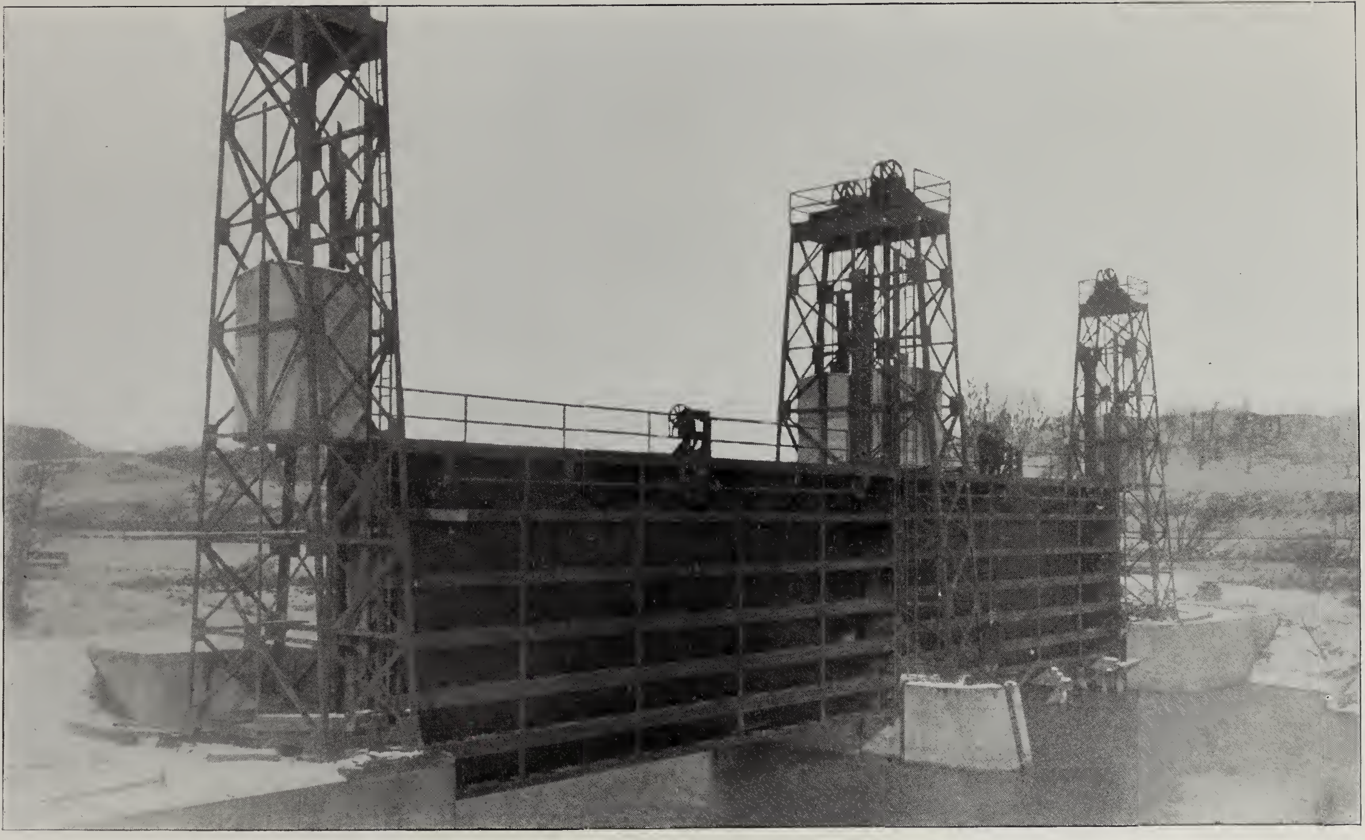
View showing the present condition of a lock and arch bridge at Little Falls, built about 1800 by the Western Inland Lock Navigation Co.,— the first company to undertake transportation improvements in the state.



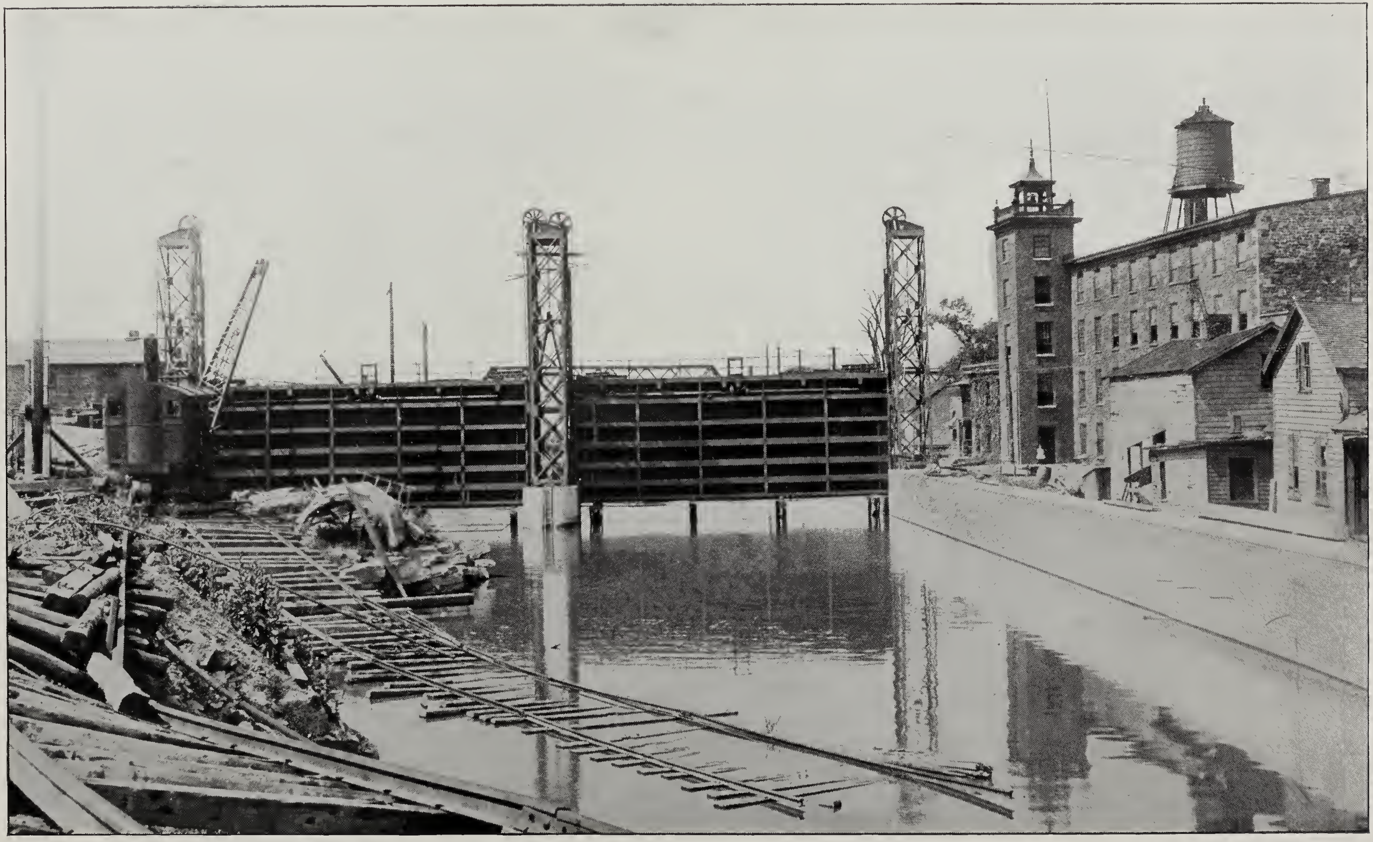
Construction of north side wall of lock at Little Falls. The feed culvert is seen at a considerable height from the bottom of the wall. It was built in this way to save excavating rock and building full width wall at the bottom. Thus the latter process of emptying the chamber will be by siphon action.



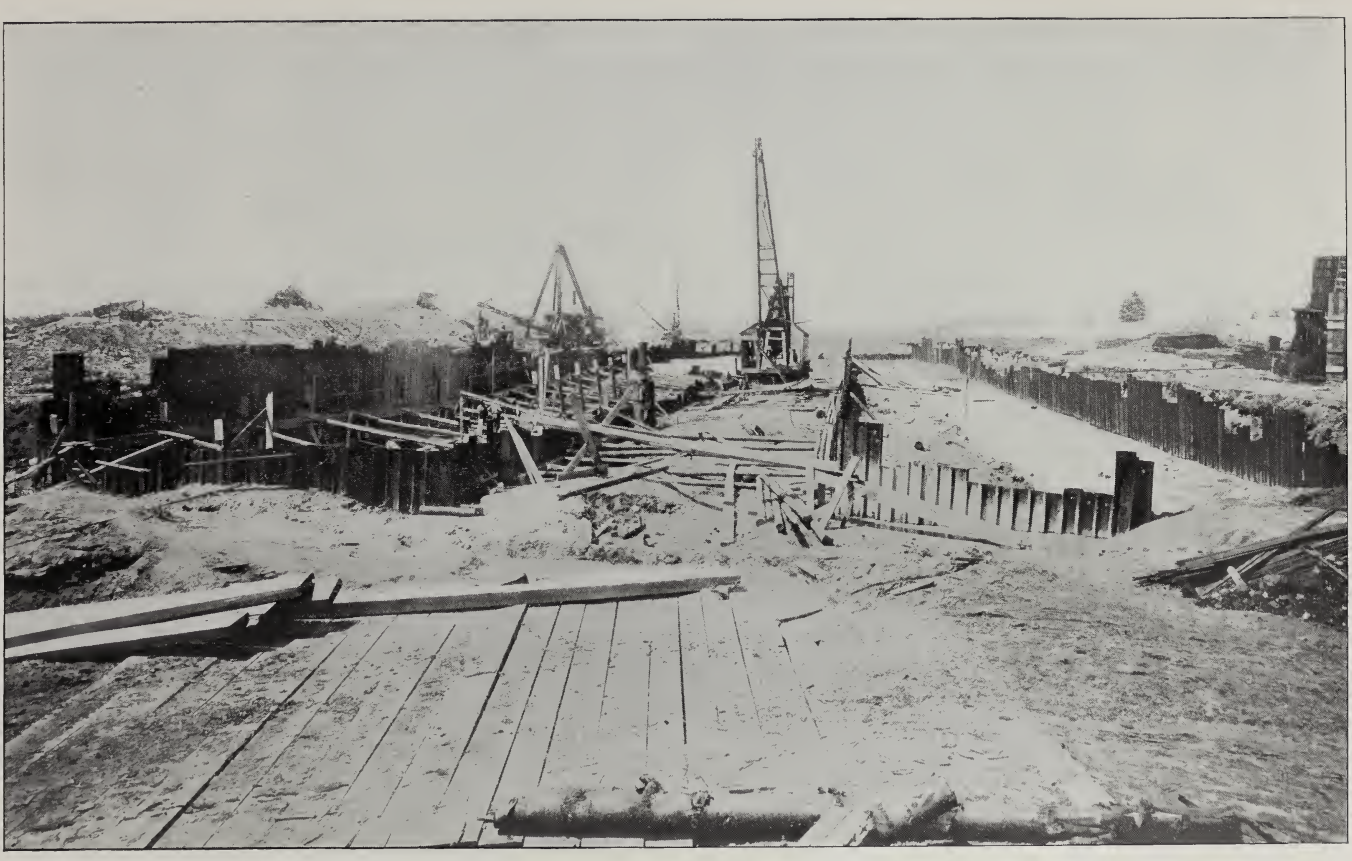
Lock No. 17, at Little Falls, of 40½ feet lift. The lower gate, of lift type, is seen in the closed position. The high side walls and the closed upper gate make the lock narrower than the standard width, which is 45 feet.



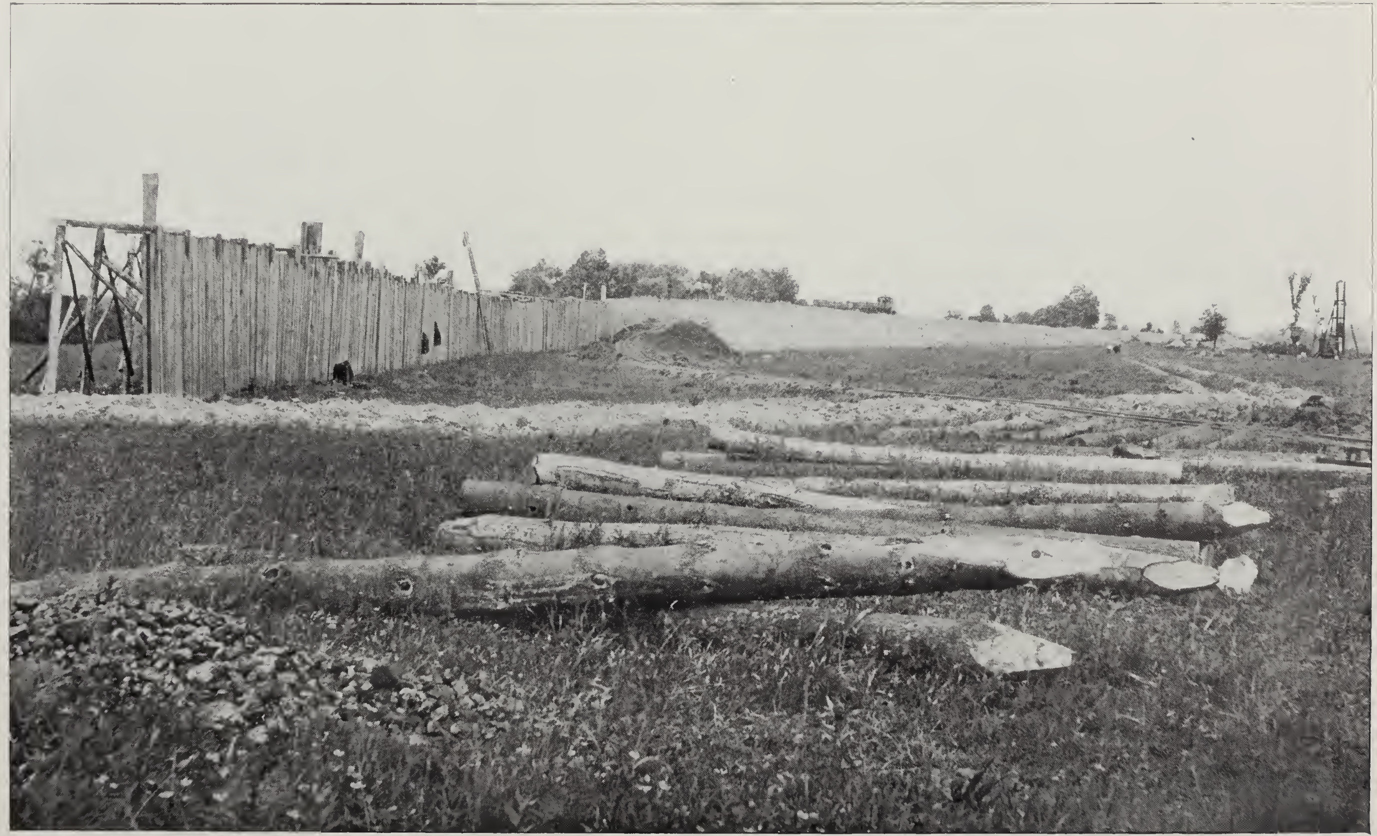
Guard-gate at Rocky Rift, a little east of Little Falls.



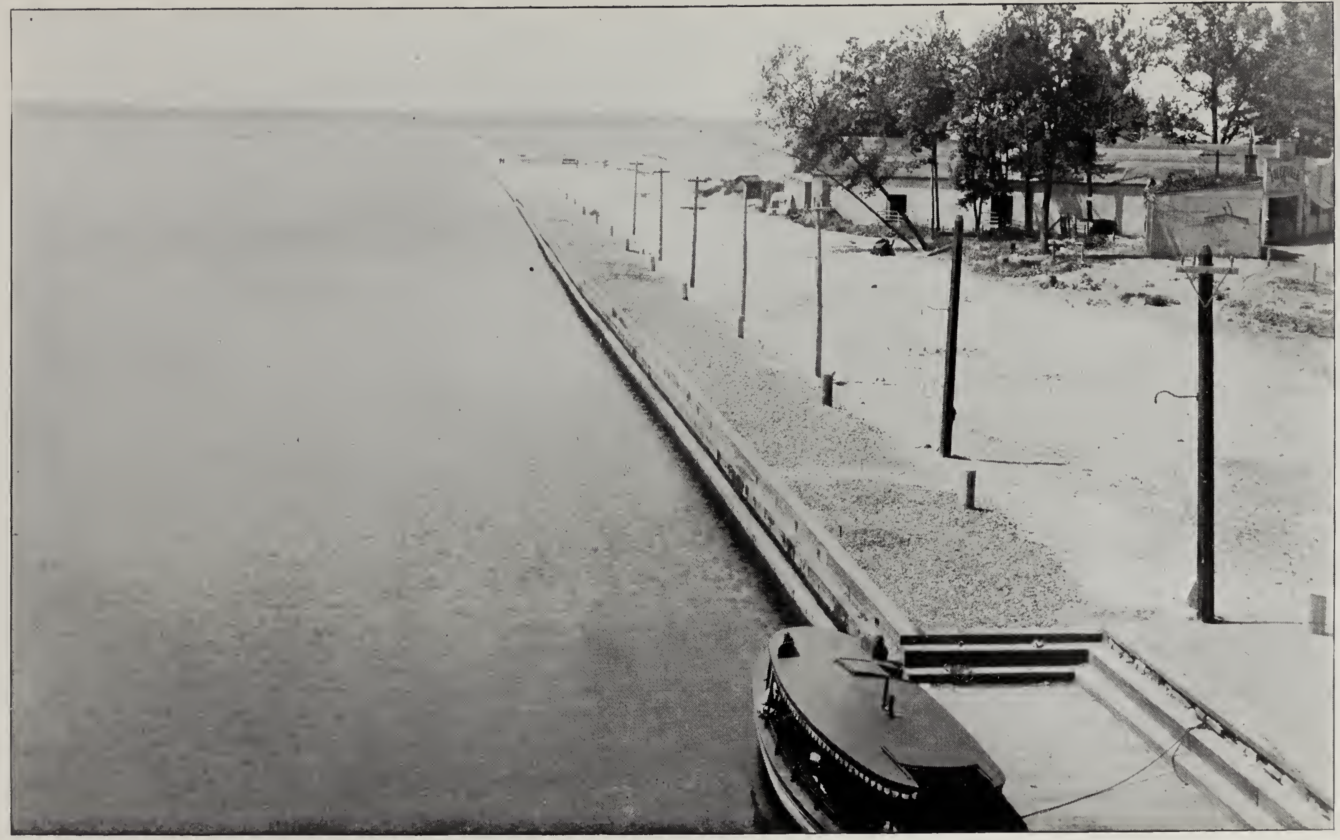
General view of the guard-gate at Little Falls.



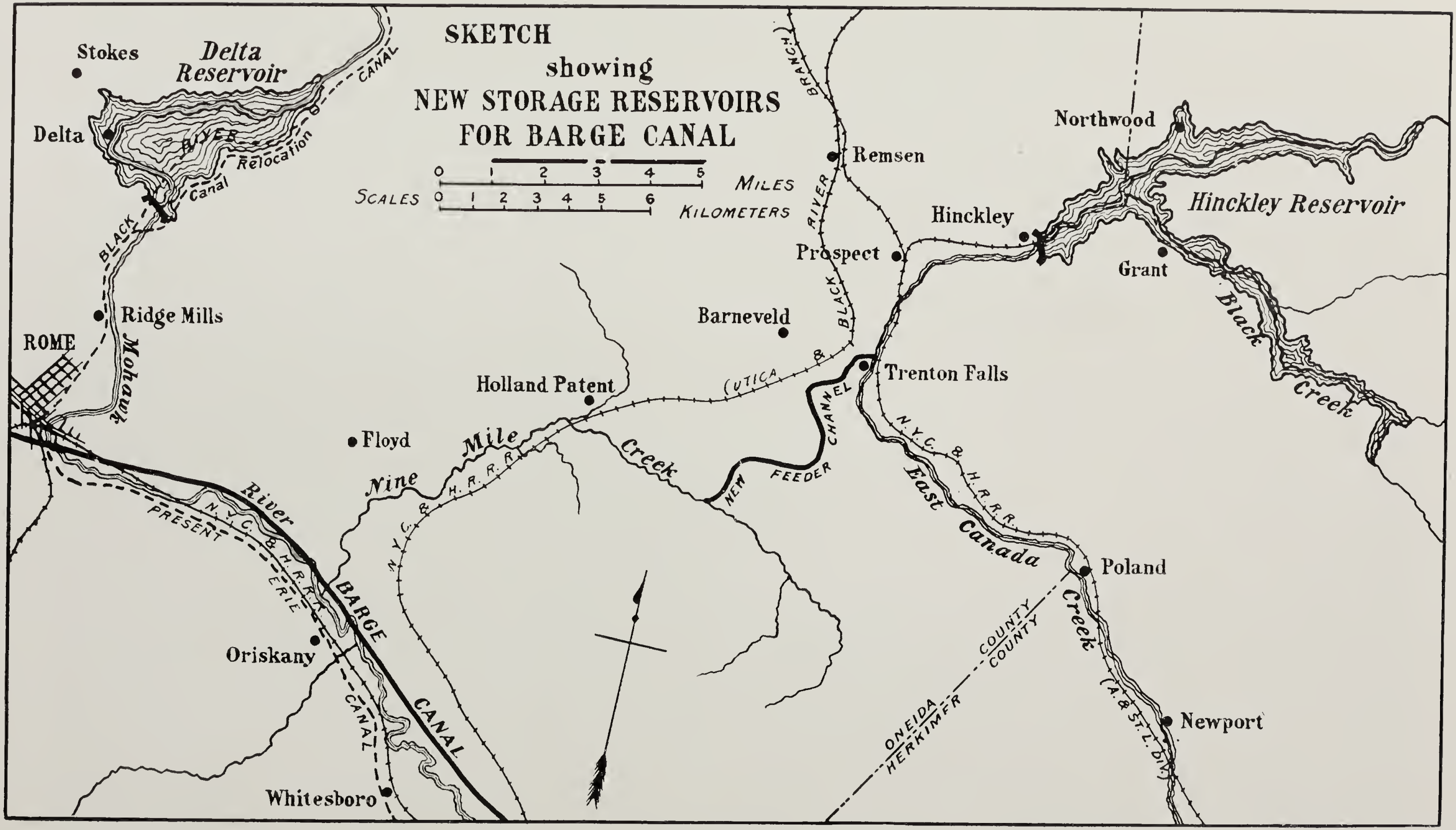
View at lock No. 21, west of Rome, showing the driving of steel piling, within which to build the side walls of the lock.



Formation of canal banks in the sandy soil west of Rome, — triple-lap sheet-piling and the spoil from excavation placed around it.



Completed pier at Sylvan Beach, at the entrance of the Barge canal into the eastern end of Oneida lake.



SKETCH
showing
NEW STORAGE RESERVOIRS
FOR BARGE CANAL

Water-Supply for Rome Summit Level.

To supply water for the Rome summit level the system of reservoirs for the present canal is retained and two large reservoirs are added — at Delta and Hinckley. To divert the waters from Hinckley a channel is being made between East Canada and Nine-Mile creeks.

CONTRACT No. 55.

Description: For constructing Delta reservoir and dam on the upper Mohawk river, 4½ miles above Rome.

Contract price (including alterations), $945,840.
Area of watershed, 137 square miles.
Area of reservoir at crest level, 4⅓ square miles.
Capacity of reservoir at crest level, 2,750,000,000 cubic feet.
Maximum depth at crest level, 70 feet.
Average depth at crest level, 23 feet.
Buildings removed (including village of Delta), 295.
Highways submerged, 10 miles.
Canal structures destroyed, 7 locks and 1 aqueduct.
Maximum flood, over 8,000 cubic feet per second.
Maximum regulated flow, 2,600 cubic feet per second.

Dam:
Length, 1,100 feet. Length of spillway, 300 feet.
Maximum height of masonry above rock, 100 feet.
Approximate height of overfall (pool to crest), 70 feet.
Masonry contents about 90,000 cubic yards.

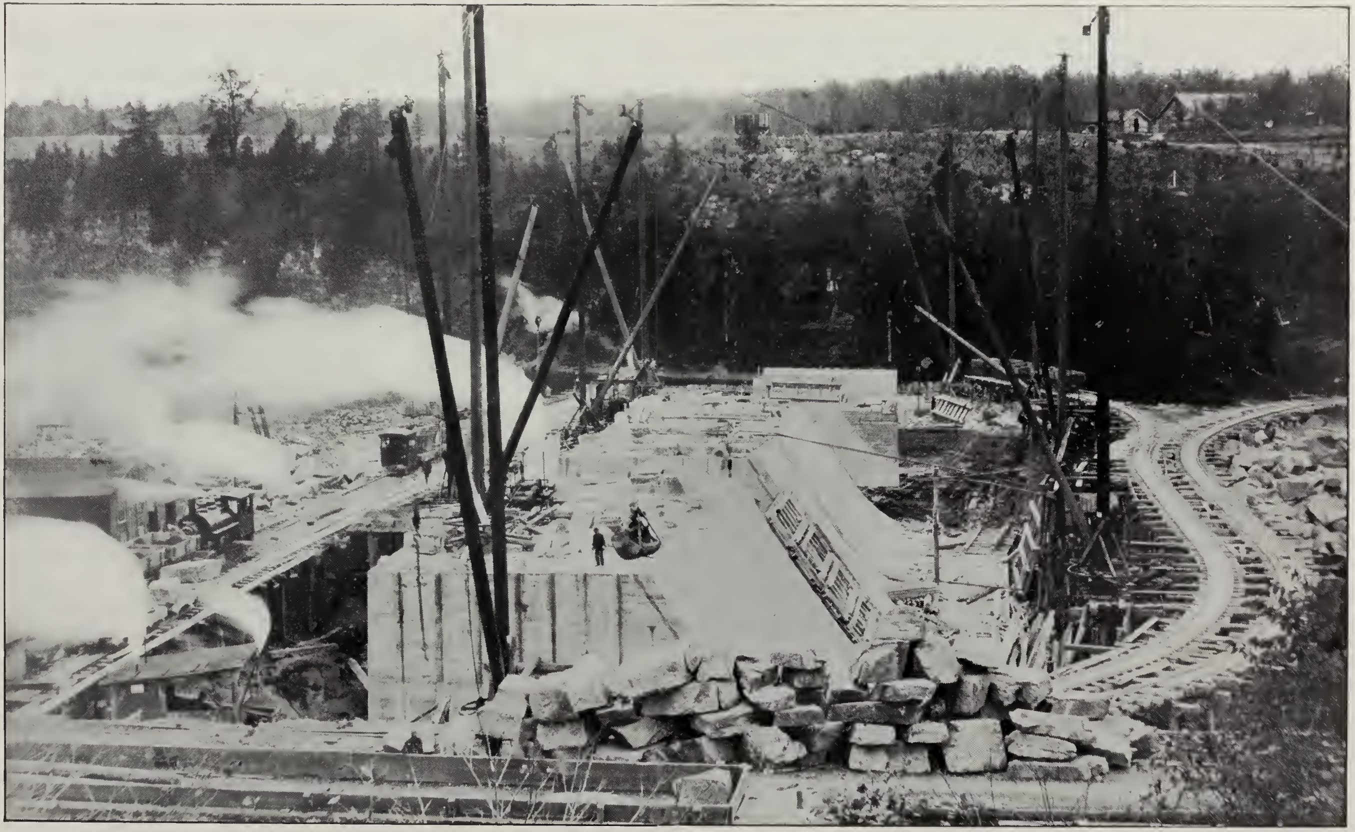
Other structures:
Canal relocation 1.9 miles.
Flight of locks, 3 lifts at 20.6 feet each.
Lock No. 7, 12.1 feet lift.
Reinforced concrete aqueduct, trunk, about 208 feet long.

CONTRACT No. 50.

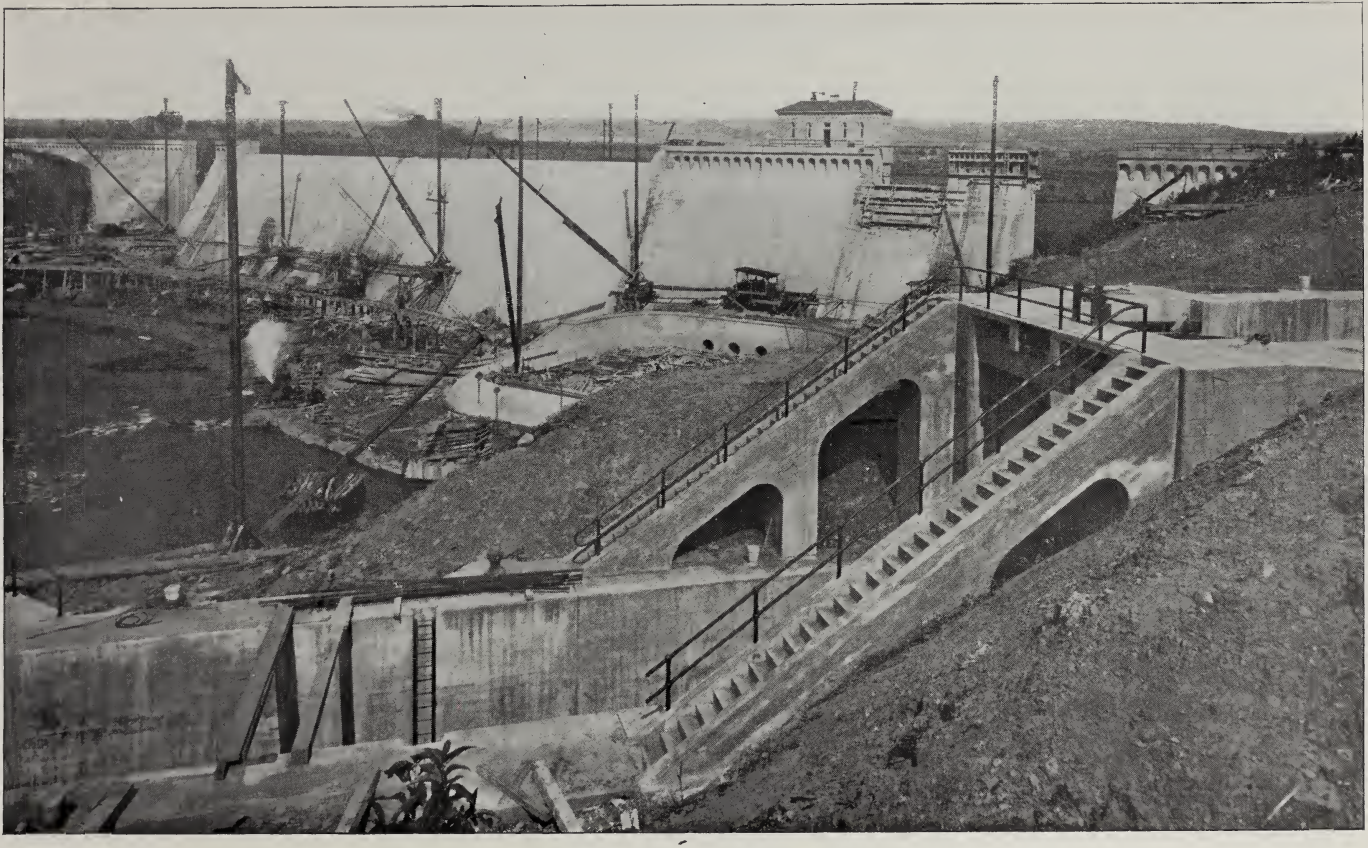
Description: For constructing the Hinckley reservoir and dam on West Canada creek.

Contract price (including alterations), $574,528.52.
Area of watershed, 372 square miles.
Area of reservoir at crest level, 4.46 square miles.
Capacity of reservoir at crest level, 3,445,000,000 cubic feet.
Maximum depth at crest level, 75 feet.
Average depth at crest level, 28 feet.
Buildings removed (including parts of three villages), 209.
Highways submerged, 7 miles.
Assumed maximum flood, 40,000 cubic feet per second.
Maximum regulated flow, 19,000 cubic feet per second.

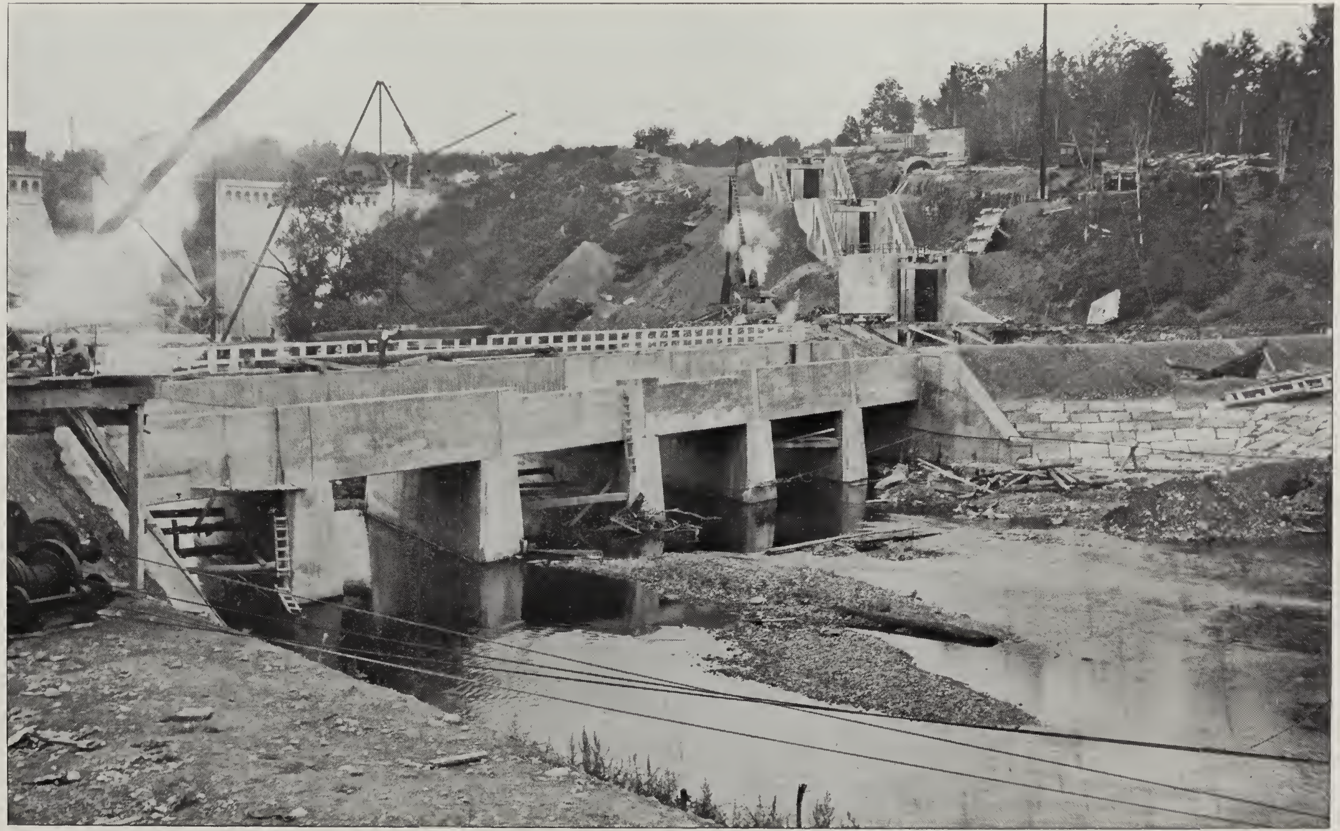
Dam:
Length, 3,700 feet. Length of spillway, 400 feet.
Length of earth dam, 3,200 feet. Length of core wall, 3,050 feet.
Maximum height of masonry above rock, 82 feet.
Maximum height of earth dam above natural surface, 56 feet.
Approximate height of overfall, 61 feet.
Masonry contents, 110,020 cubic yards.
Amount of embankment, 611,200 cubic yards.



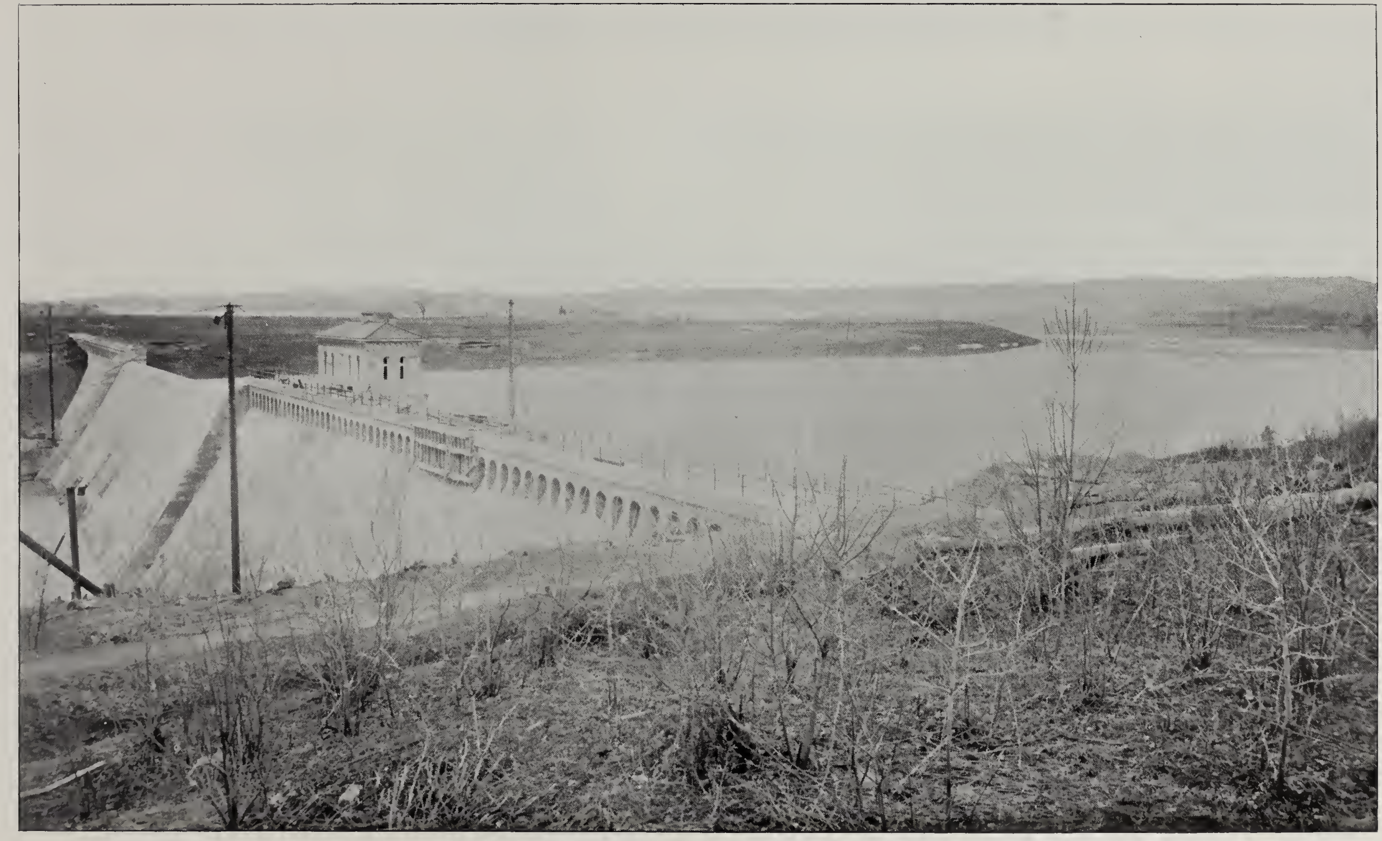
Dam at Delta reservoir during construction. The precipitous river bank, known locally as the "Palisades," may be seen beyond the dam.



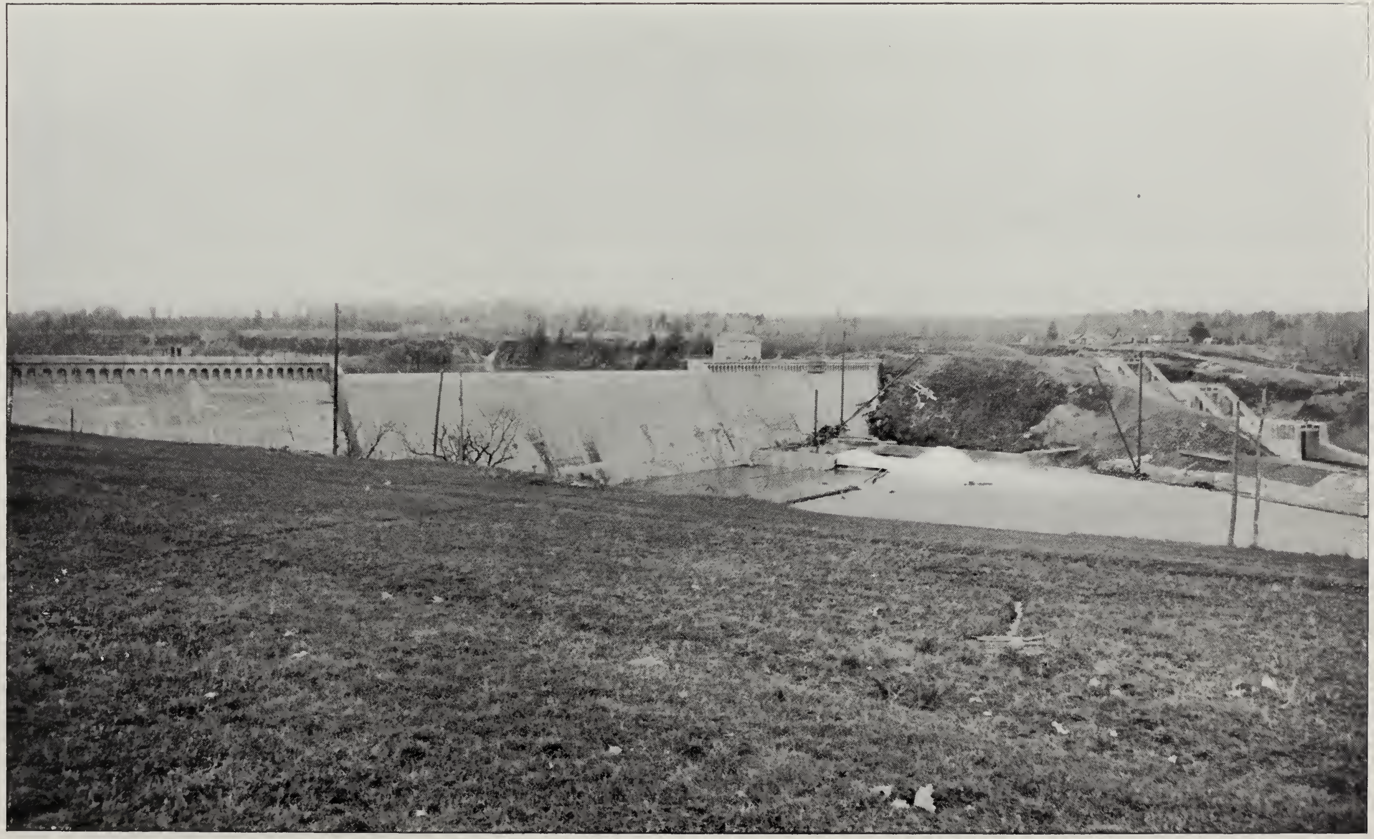
A view from below the nearly completed dam at Delta reservoir, showing in the foreground a portion of the flight of locks of the relocated Black River canal, while just beyond is the discharge pool below the pipes in the dam.



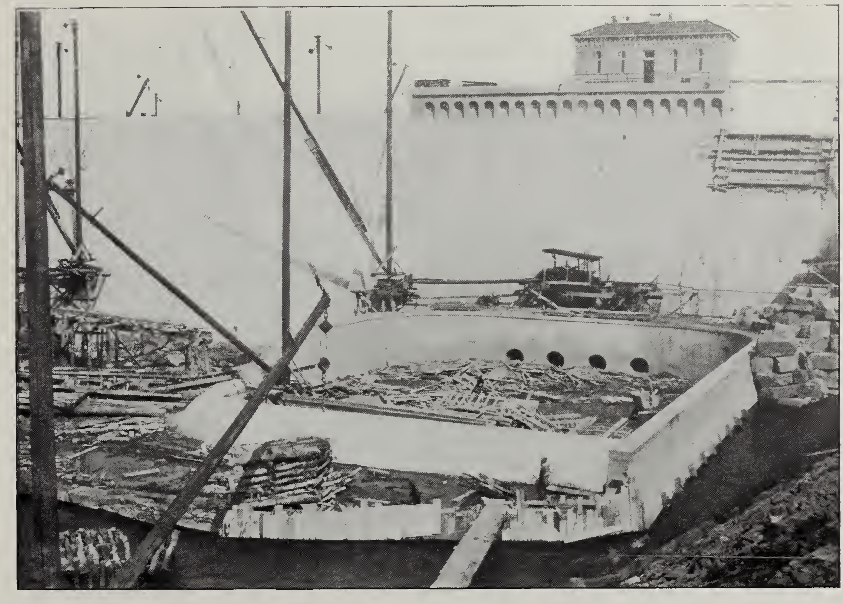
Aqueduct and flight of locks for the relocated Black River canal, just below the dam of the Delta reservoir.



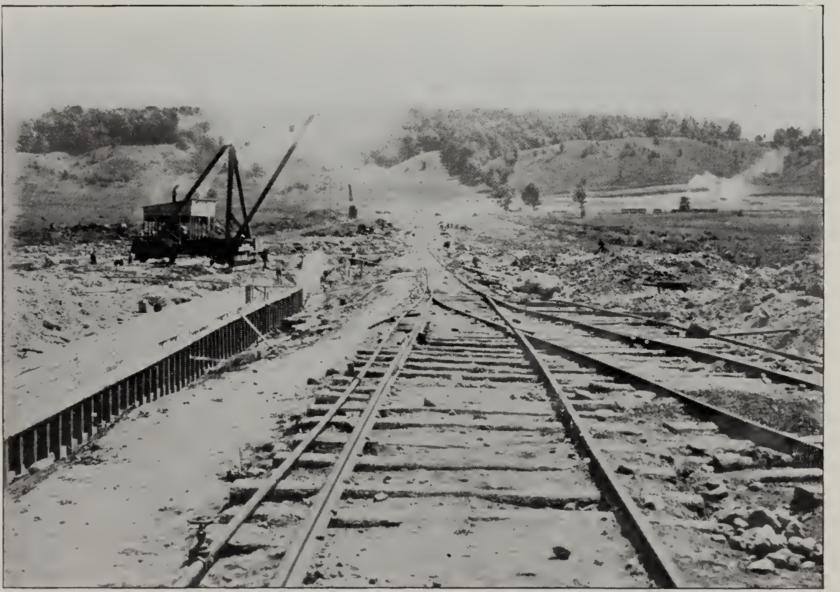
View of the completed dam at Delta reservoir, showing the partially filled reservoir.



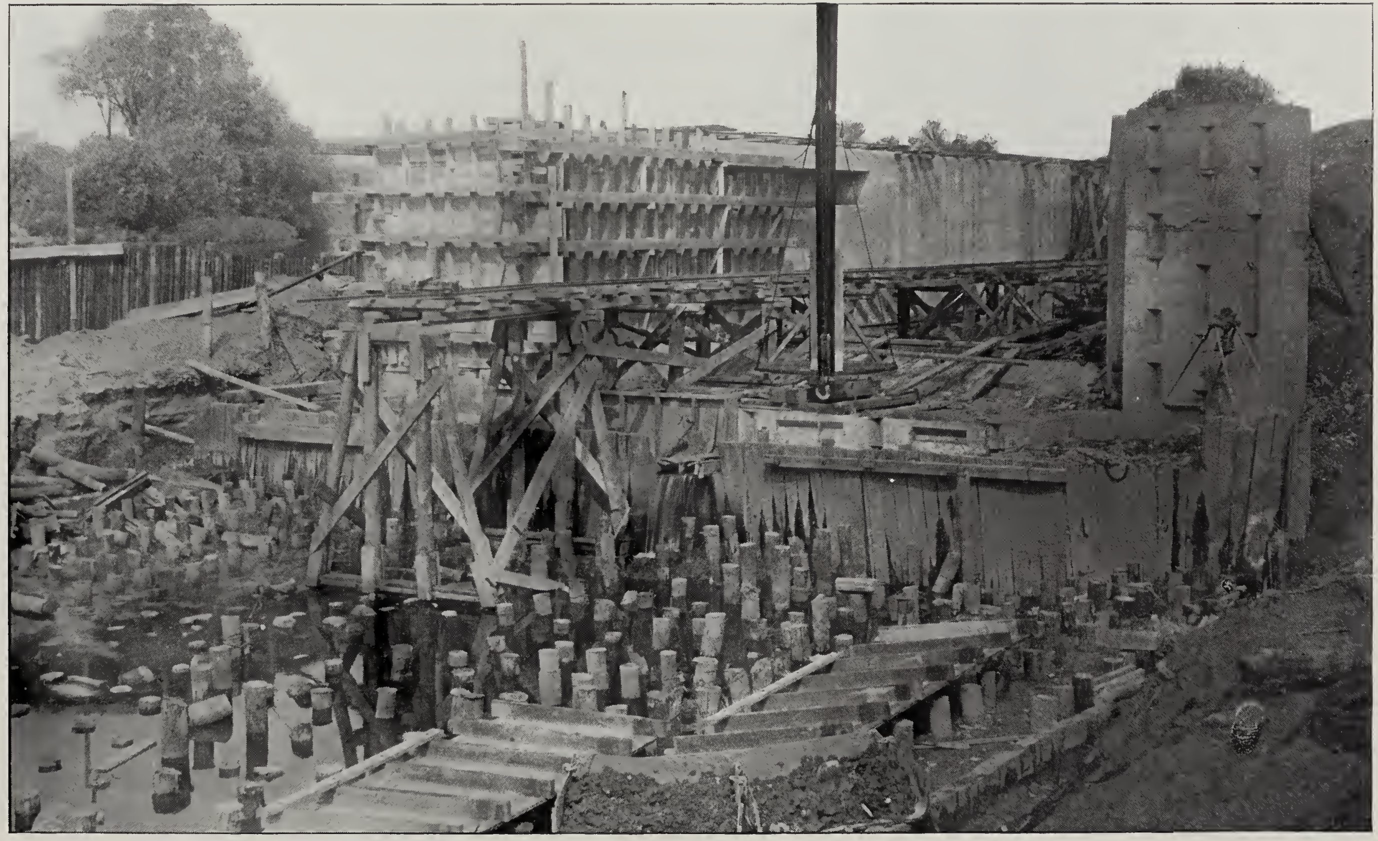
View of the completed dam at Delta reservoir, showing also the flight of locks for the relocated Black River canal.



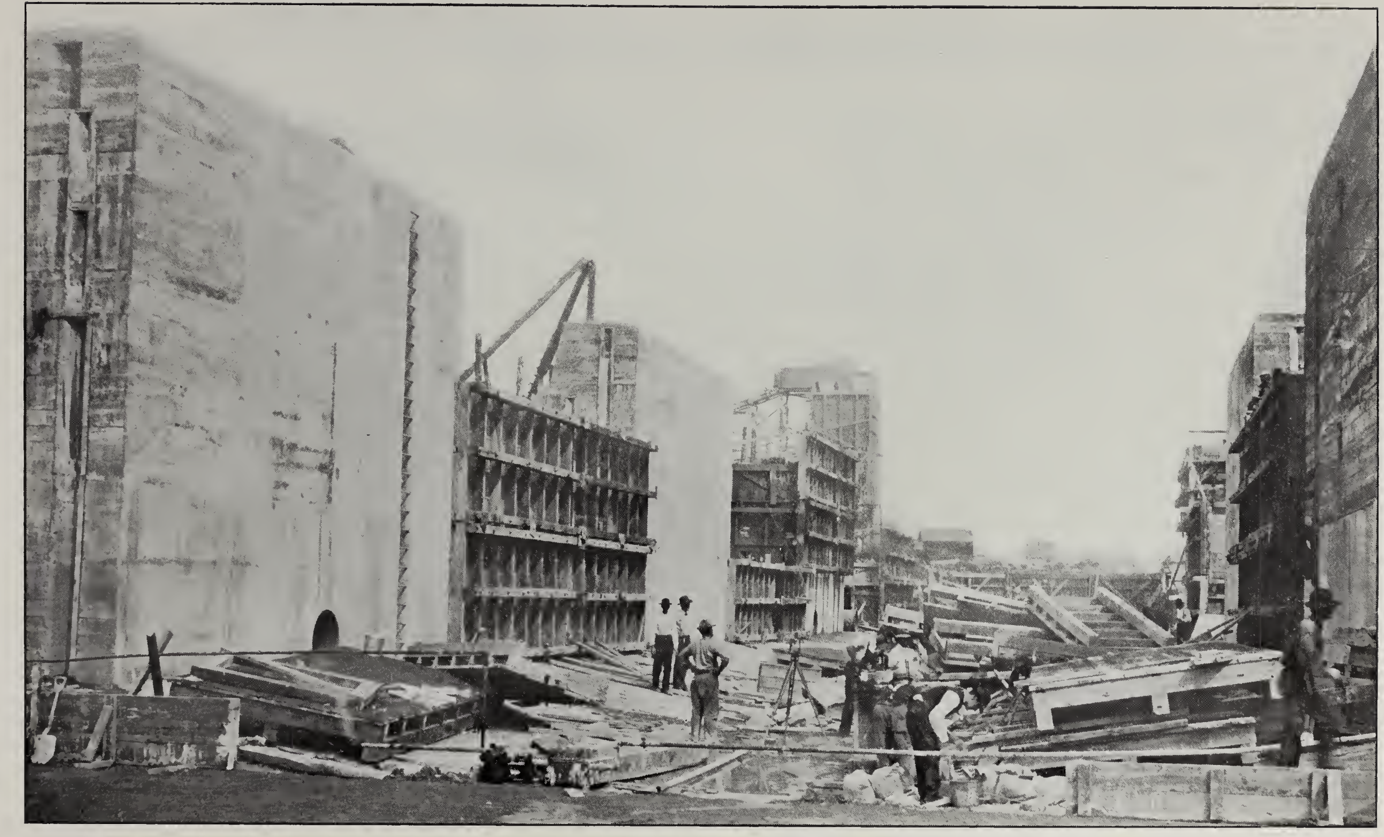
Discharge pool below the dam at Delta reservoir.



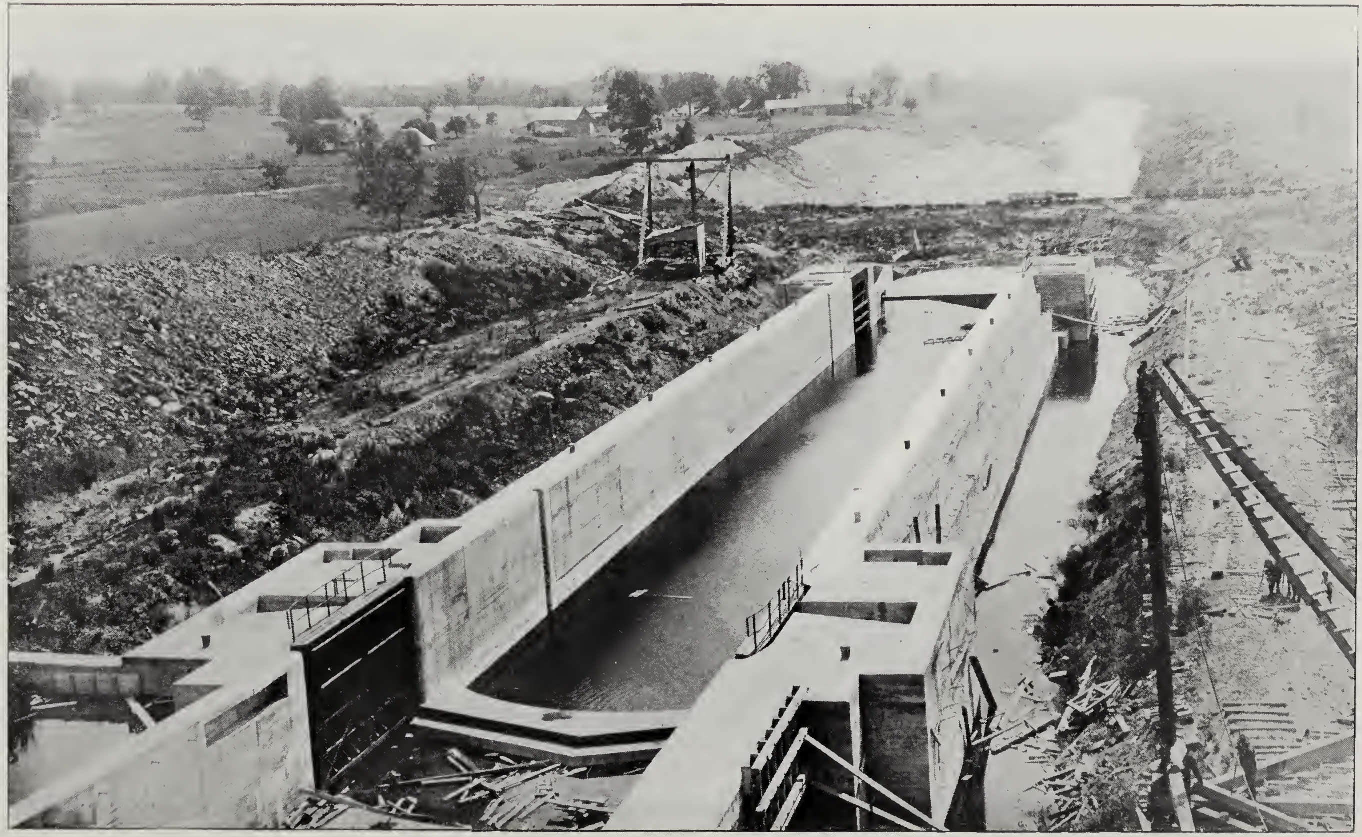
View looking south along the line of Hinckley reservoir dam. The beginning of the core wall is seen at the left.



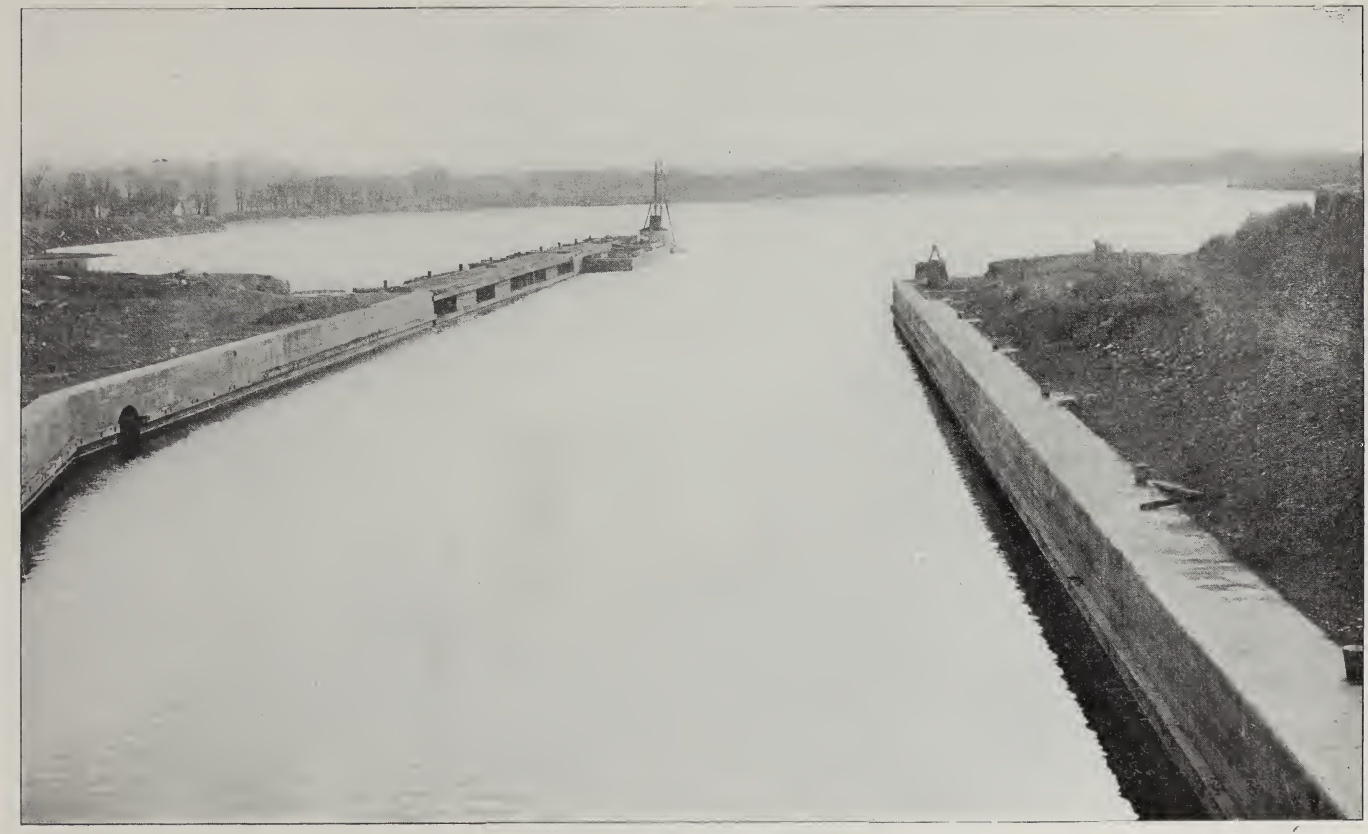
View showing construction of lock No. 7, Champlain canal, near Fort Edward; built at the edge of the Hudson river, where the canal leaves the river and begins its ascent over the low divide separating the Hudson river and Lake Champlain watersheds.



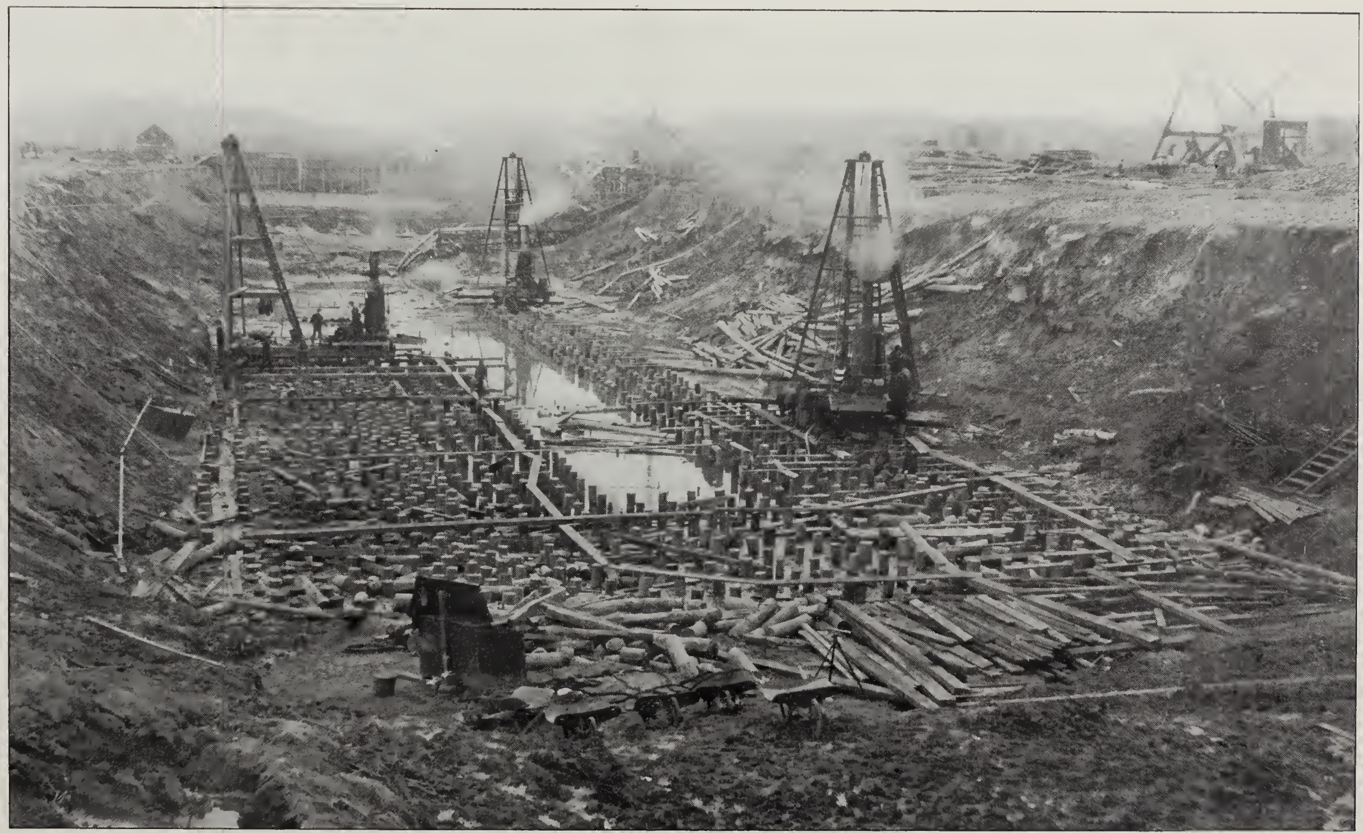
Lock No. 8, Champlain canal, near Fort Edward, showing side walls in process of construction.



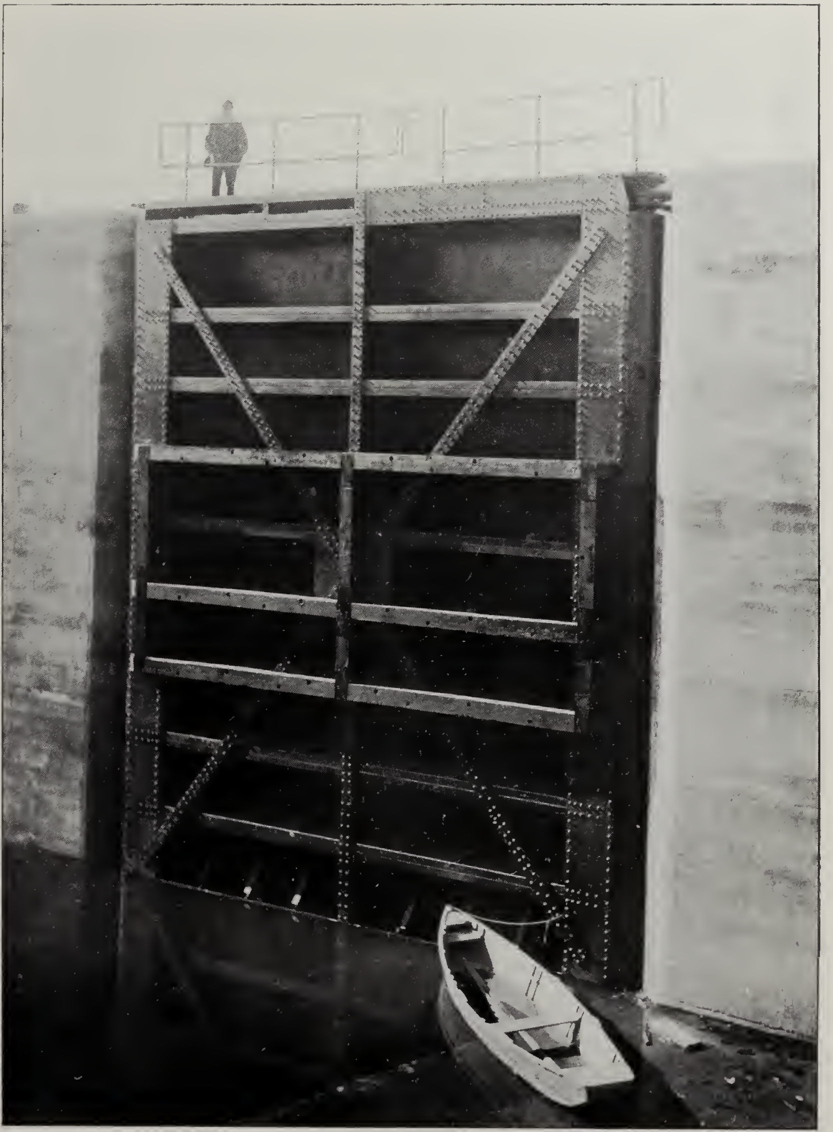
Bird's-eye view of lock No. 8, Champlain canal, near Fort Edward, nearing completion.



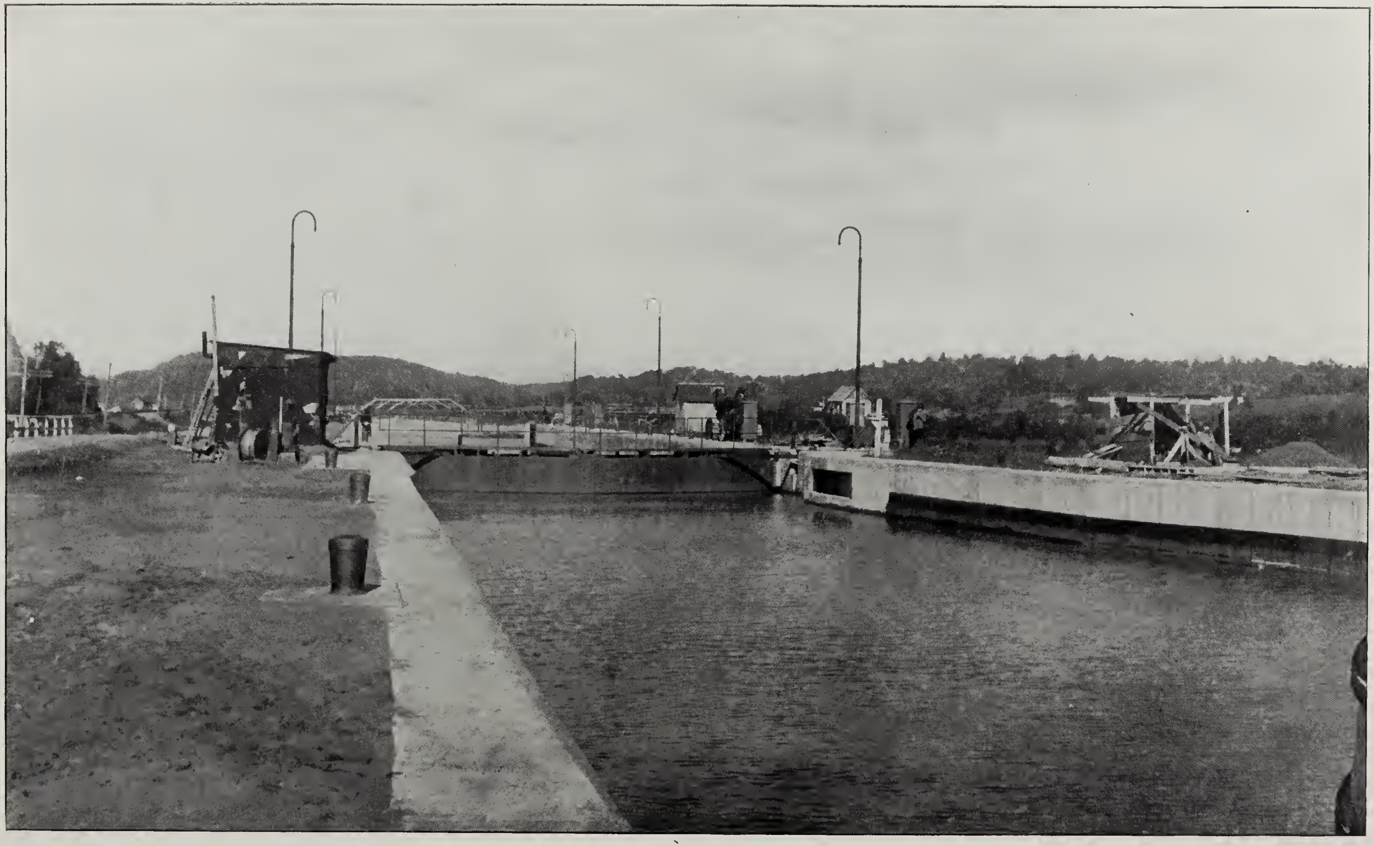
Entrance into a land line from the Hudson at Fort Miller.



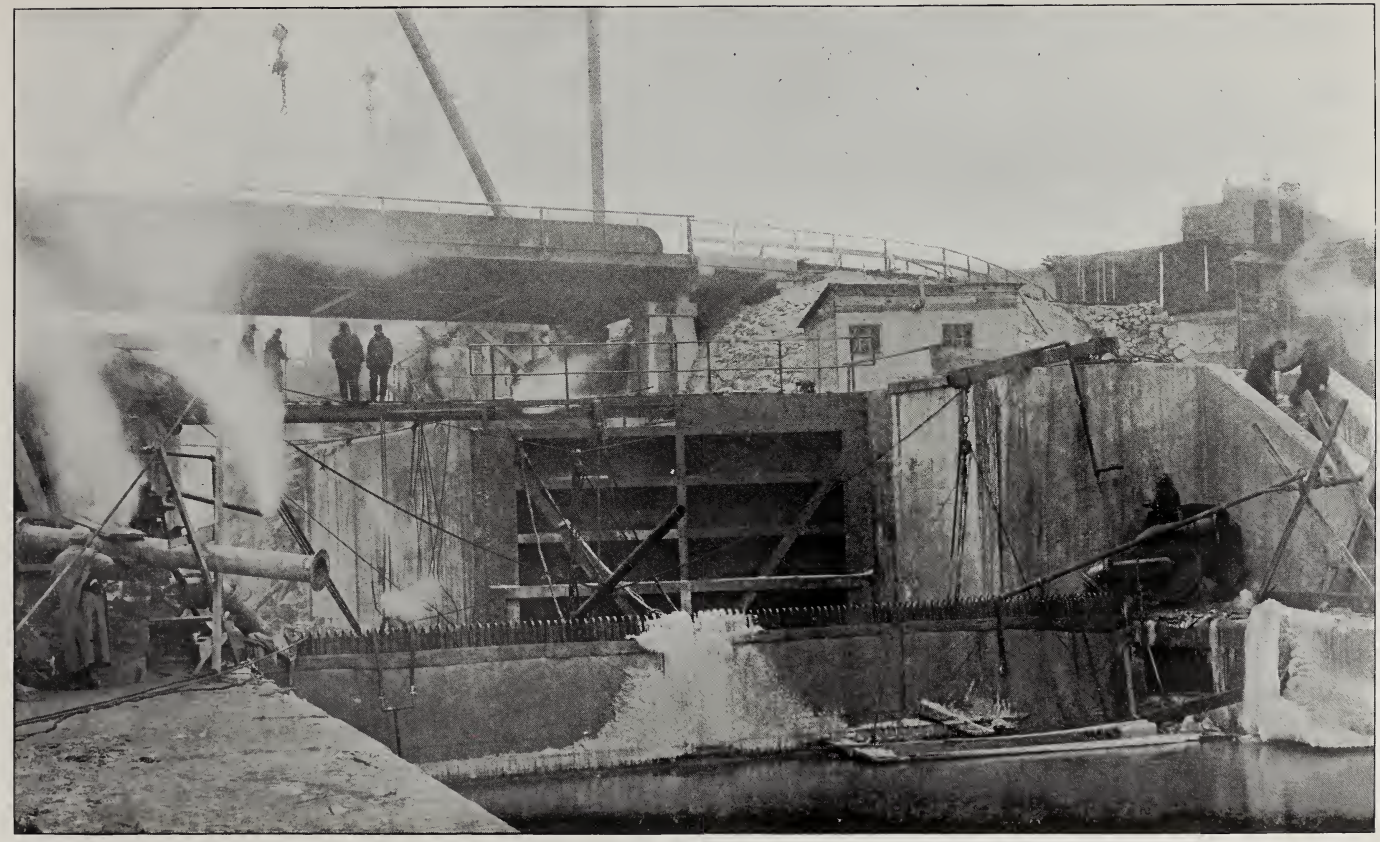
Pile foundation for lock No. 11, Champlain canal, at Comstock.



A lower gate of lock No. 11, Champlain canal.



View from the upper level, looking towards lock No. 11, Champlain canal, at Comstock. This lock was in operation during the season of 1911.

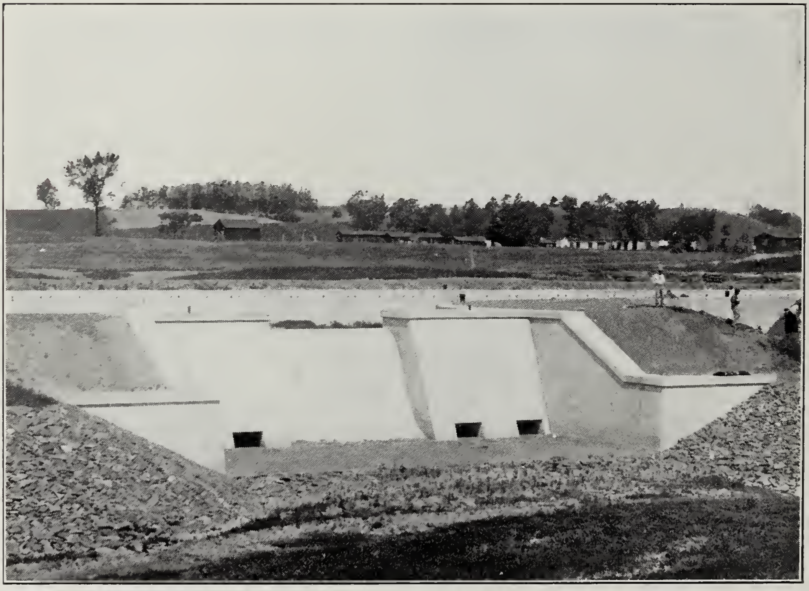


Lock No. 12, Champlain canal, where the canal enters the head of Lake Champlain. View showing a needle-dam, formed by needles standing in a groove and resting against the closed buffer-beam.

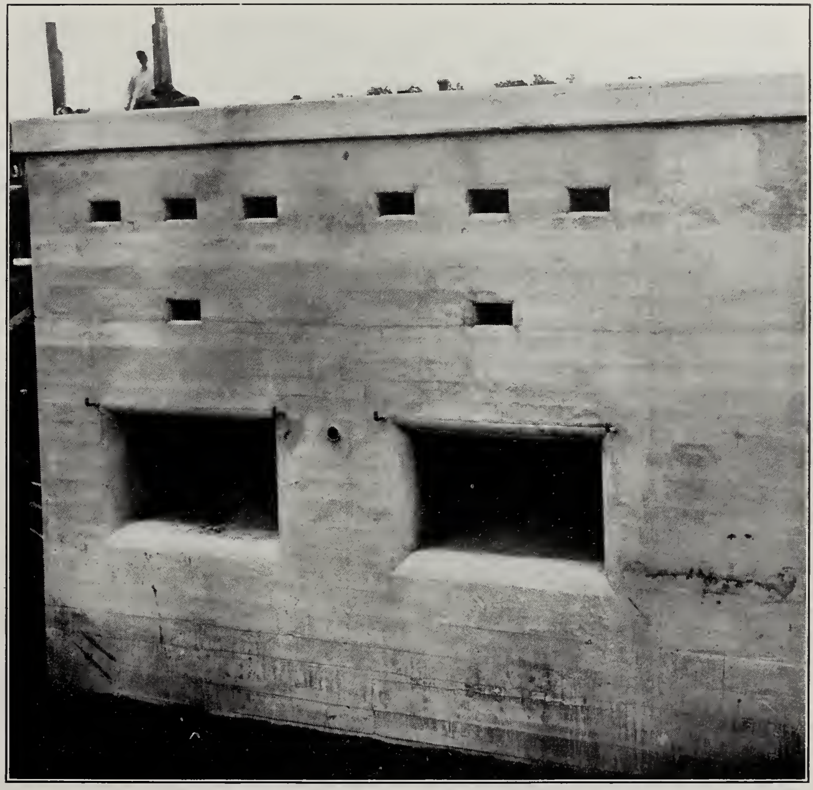
Siphon Spillways.

At three localities on the Champlain division of the Barge canal there are being built structures of a new type — intended to fill the office of spillway or waste-weir. These structures have been designated "siphon spillways." It is believed that in them the siphon principle is used for the first time to create a spillway of any considerable size. The siphon action is entirely automatic, in both the starting and stopping of the flow.

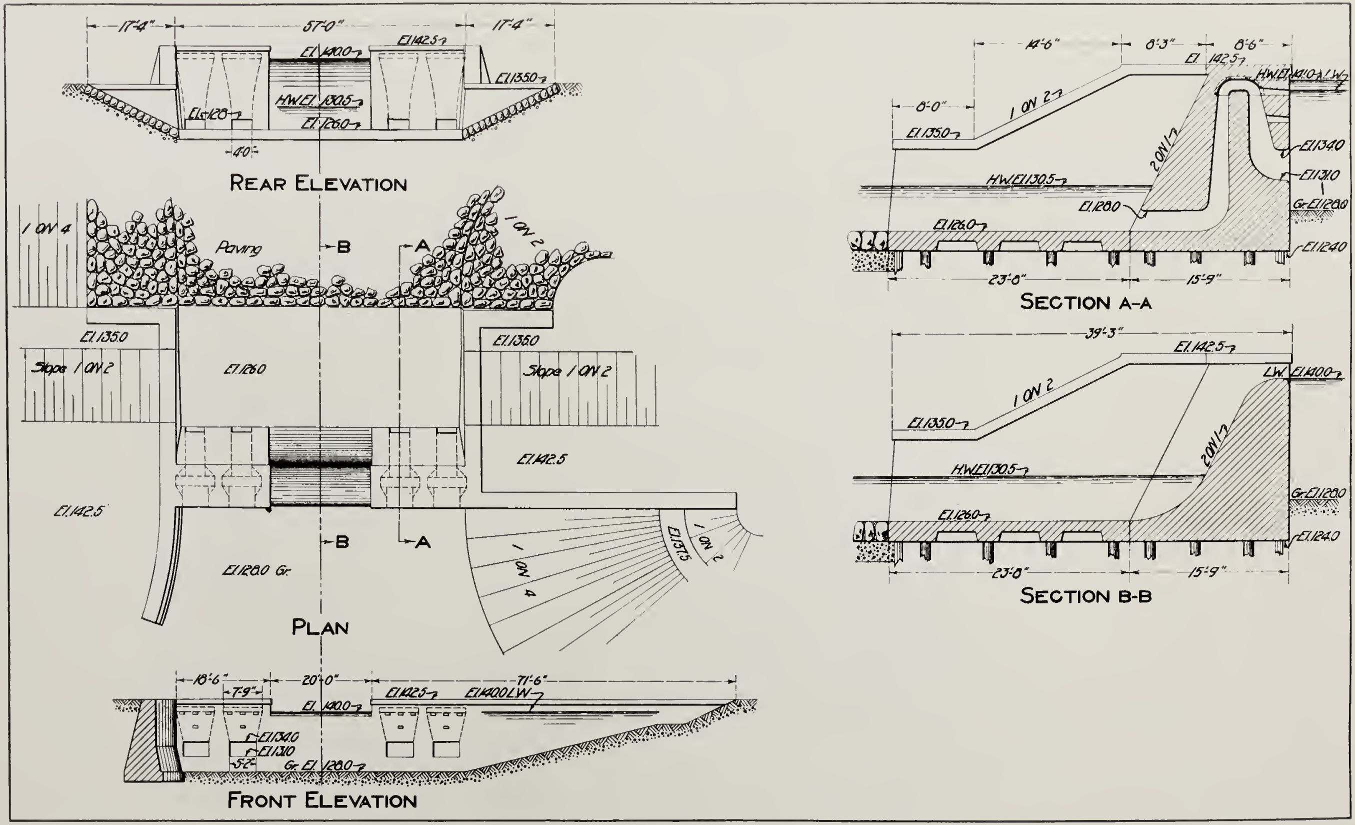
At the place shown in the photographs it was necessary to provide for a maximum outflow of about 700 cubic feet per second and to limit the fluctuation of water-surface to about one foot. The ordinary waste-weir of a capacity sufficient to take care of this flow, with a depth of only one foot of water on the crest, would require a spillway 200 feet long. The siphon spillway, however, which measures but 57 feet between abutments, accomplishes the same result. This particular structure consists of four siphons, each having an area of 7¾ square feet and working under a 10½-foot head. There is also a 20-foot drift gap to carry off floating debris.



Outlets of a siphon spillway, with a short drift gap between. This structure is used to regulate automatically the water-surface in the canal where space is not available for a long spillway of the ordinary type.



Intakes and vents of two siphons of a siphon spillway, before gratings had been hung over the intakes.

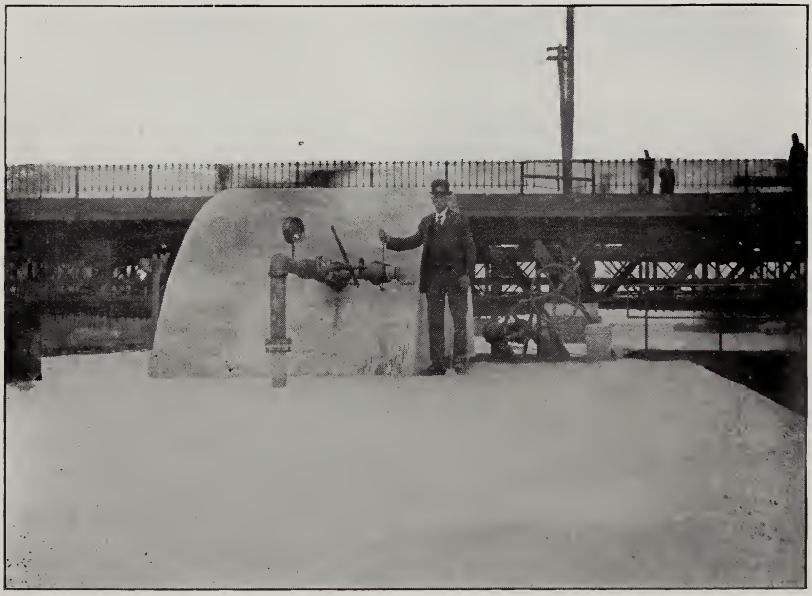


Plan, elevations and sections of a siphon spillway.

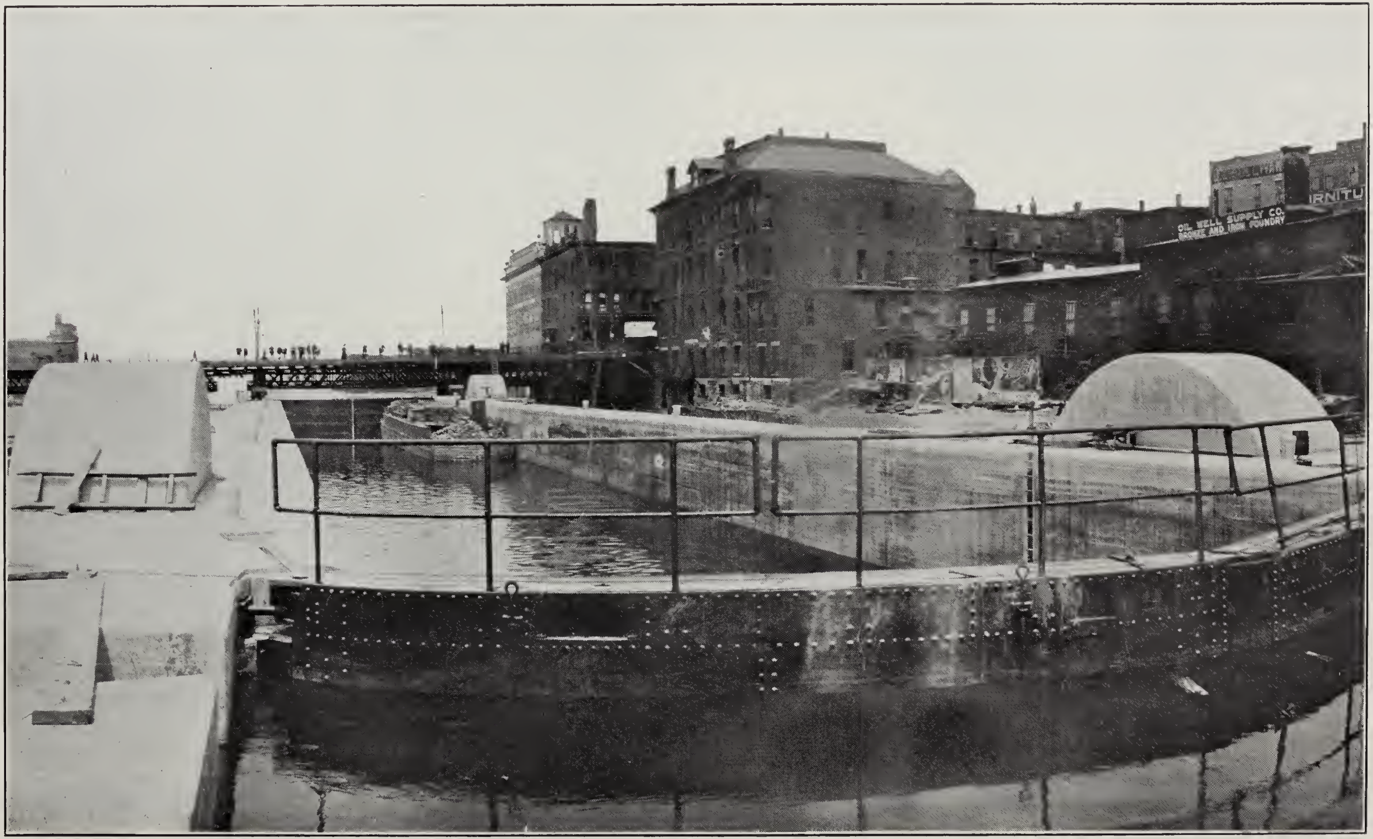
Siphon Lock.

In the city of Oswego there has been constructed a siphon lock — the only lock of this type on the Barge canal and also the first to be built in this country and the largest employing the siphon principle yet built.

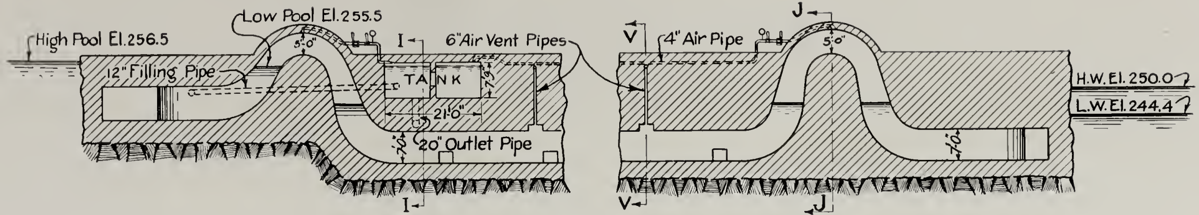
This lock has been in use for two years and in general its operation has been satisfactory. Using both siphons the lock chamber can be filled in 4½ to 5 minutes, while it can be emptied in 5½ to 6 minutes. The draft of the siphon is such that soon after the flow has started the direction of the air is reversed and the vacuum is restored in the tank. Thus the operating power is self-renewing and, except for air leakage, lockages can be conducted by merely manipulating the 4-inch air valves. However, to avoid having to refill the tank when traffic is very infrequent, the plan has been adopted of closing the 20-inch outlet valve, thus holding the water in the tank.



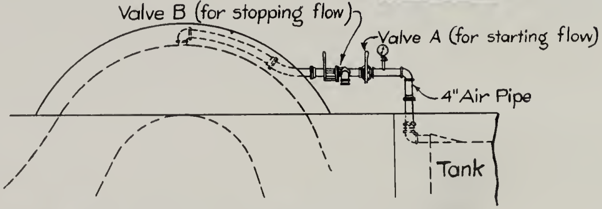
One of the lower siphons of the siphon lock at Oswego, showing the operating valves.



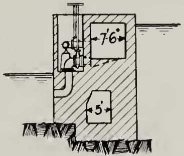
General view of the siphon lock at Oswego, showing a boat of the present canal size being locked through.



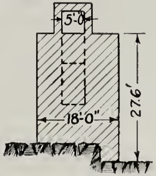
Longitudinal Section of Lock Wall



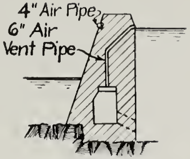
Operating Valves at Upper Siphon



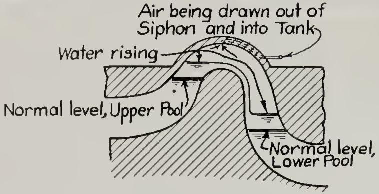
Section I-I



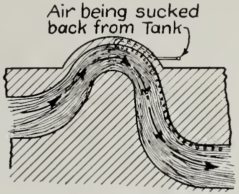
Section J-J



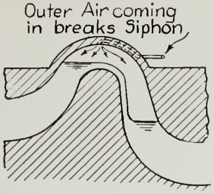
Section V-V



Starting Siphon

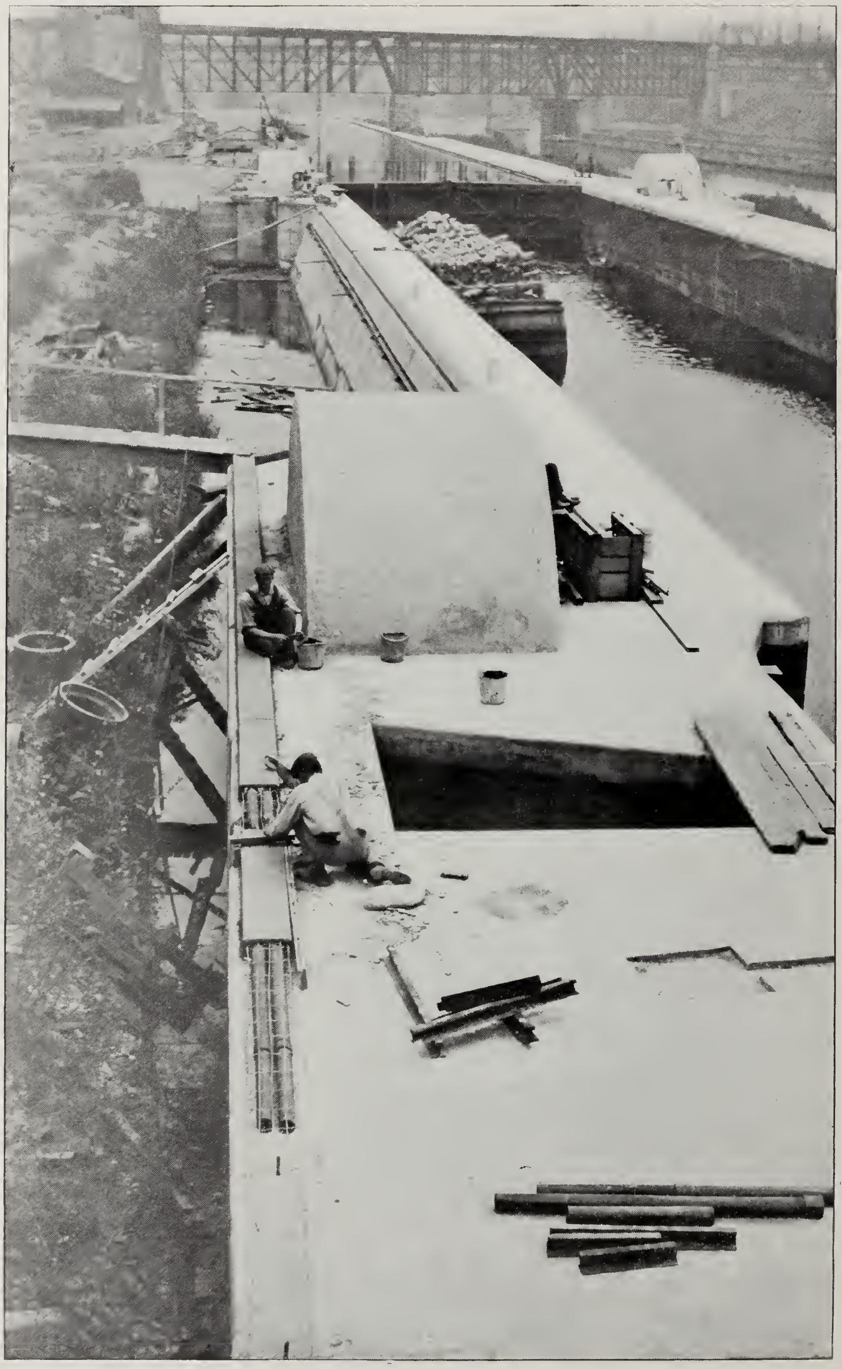


Siphon flowing full

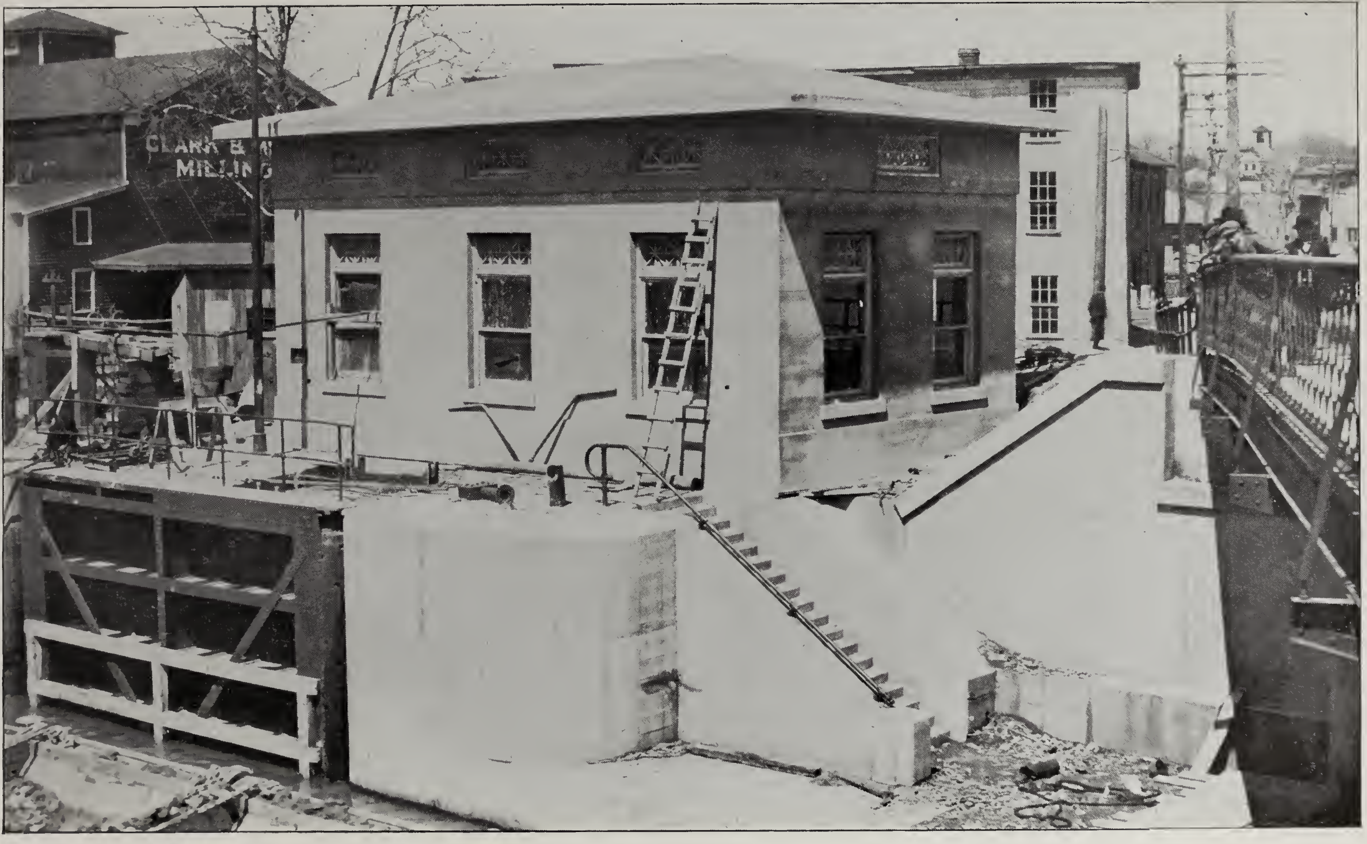


Siphon being stopped

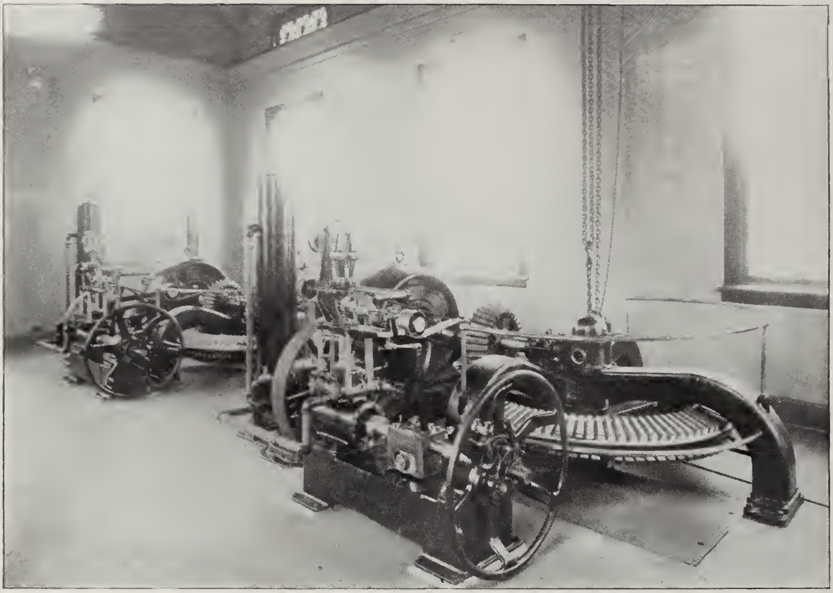
Sketches Showing Action of Siphon,
LOCK No. 8, OSWEGO N.Y.

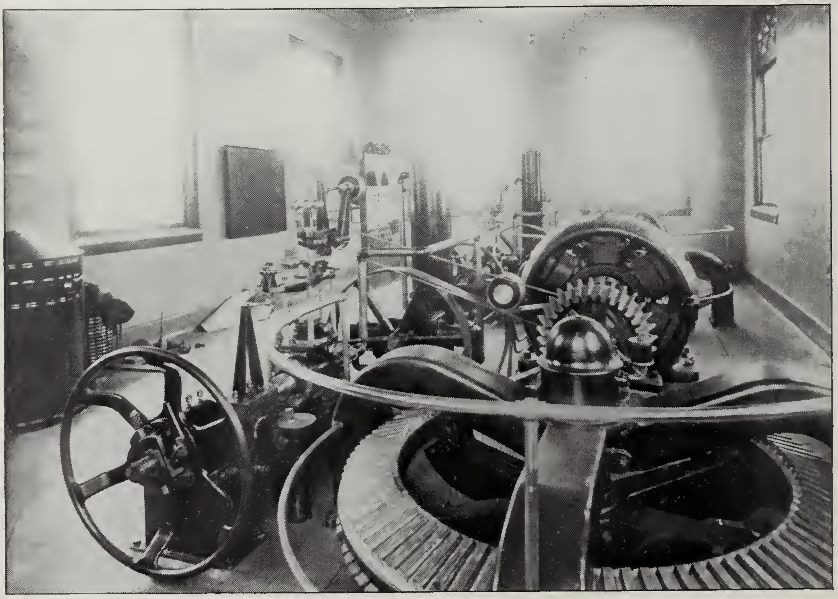


Progress on electric installation for operating machinery at the siphon lock at Oswego.

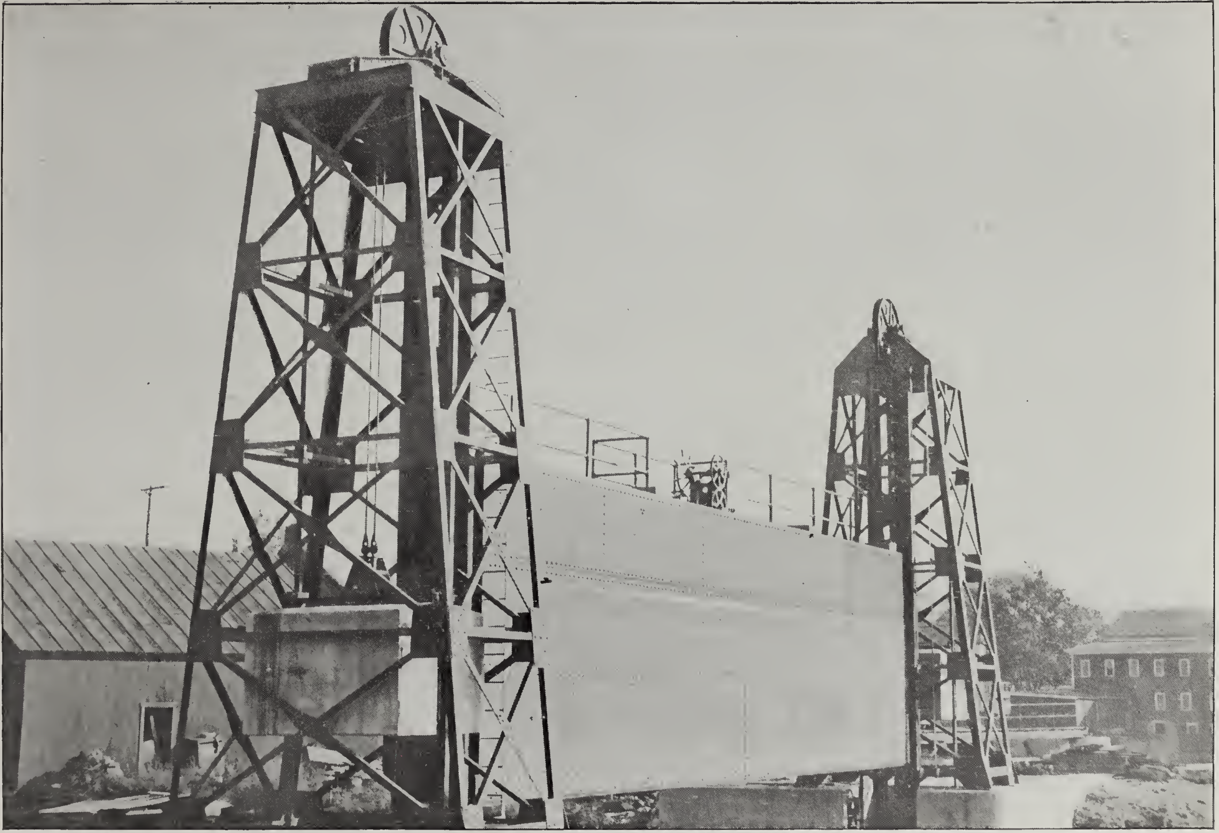


Power house at lock No. 24, at Baldwinsville.

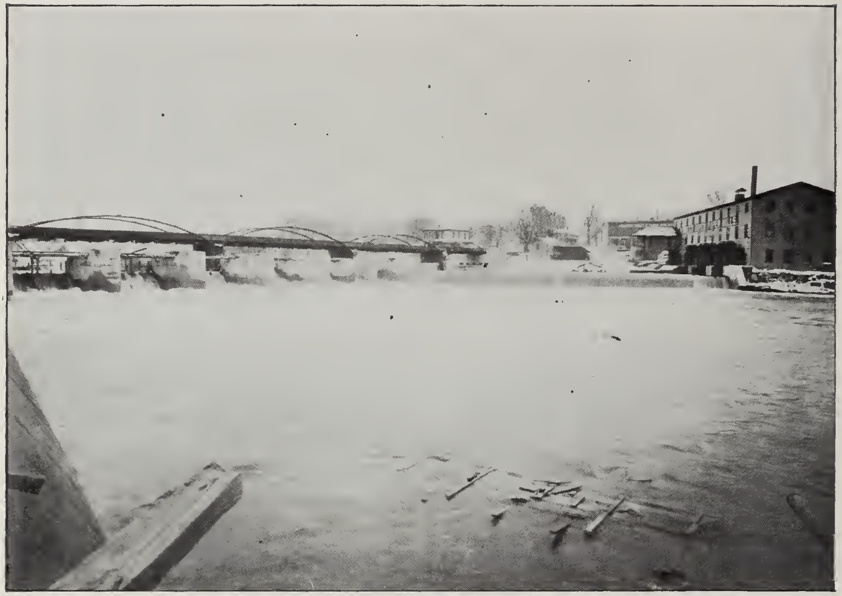




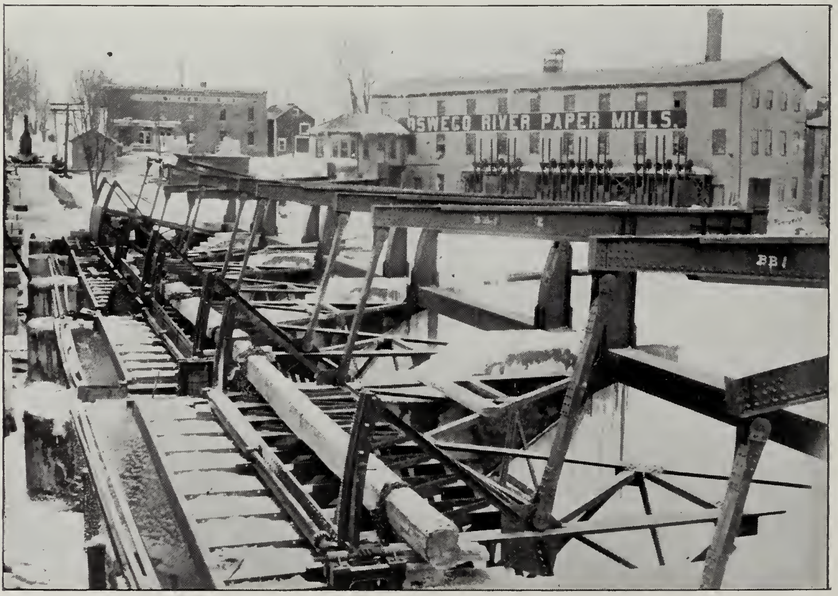
Interior views of the power house at lock No. 24, Baldwinsville, showing two 50-kw., direct-current, 250-volt generators, connected through bevel gearing to 100-hp. water turbines. The governor shown is a type of Lombard governor made especially for Barge canal work. Overhead is a 3-ton traveling crane. The house is lighted with four 100-watt tungsten lamps.



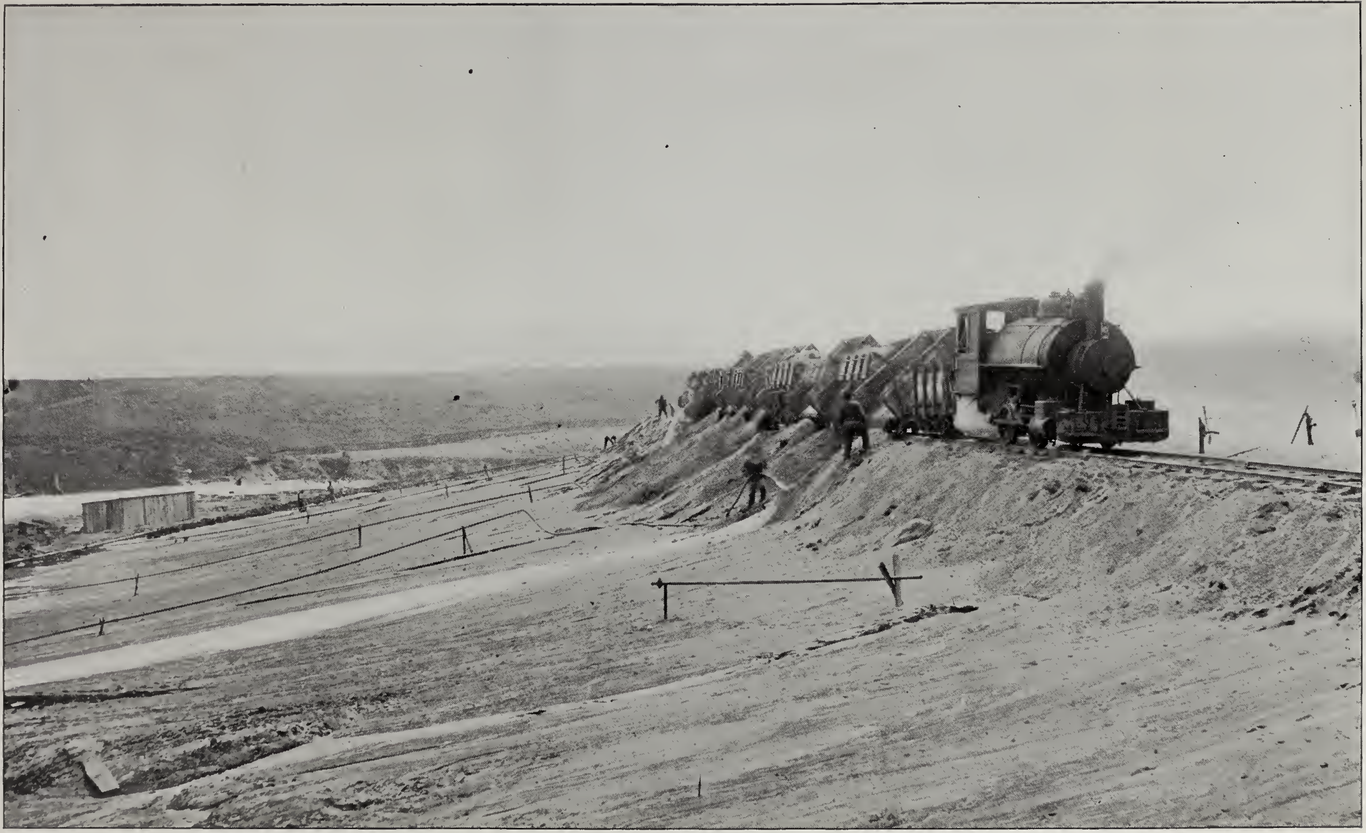
Guard-gate at the head of an old canal channel at Baldwinsville.



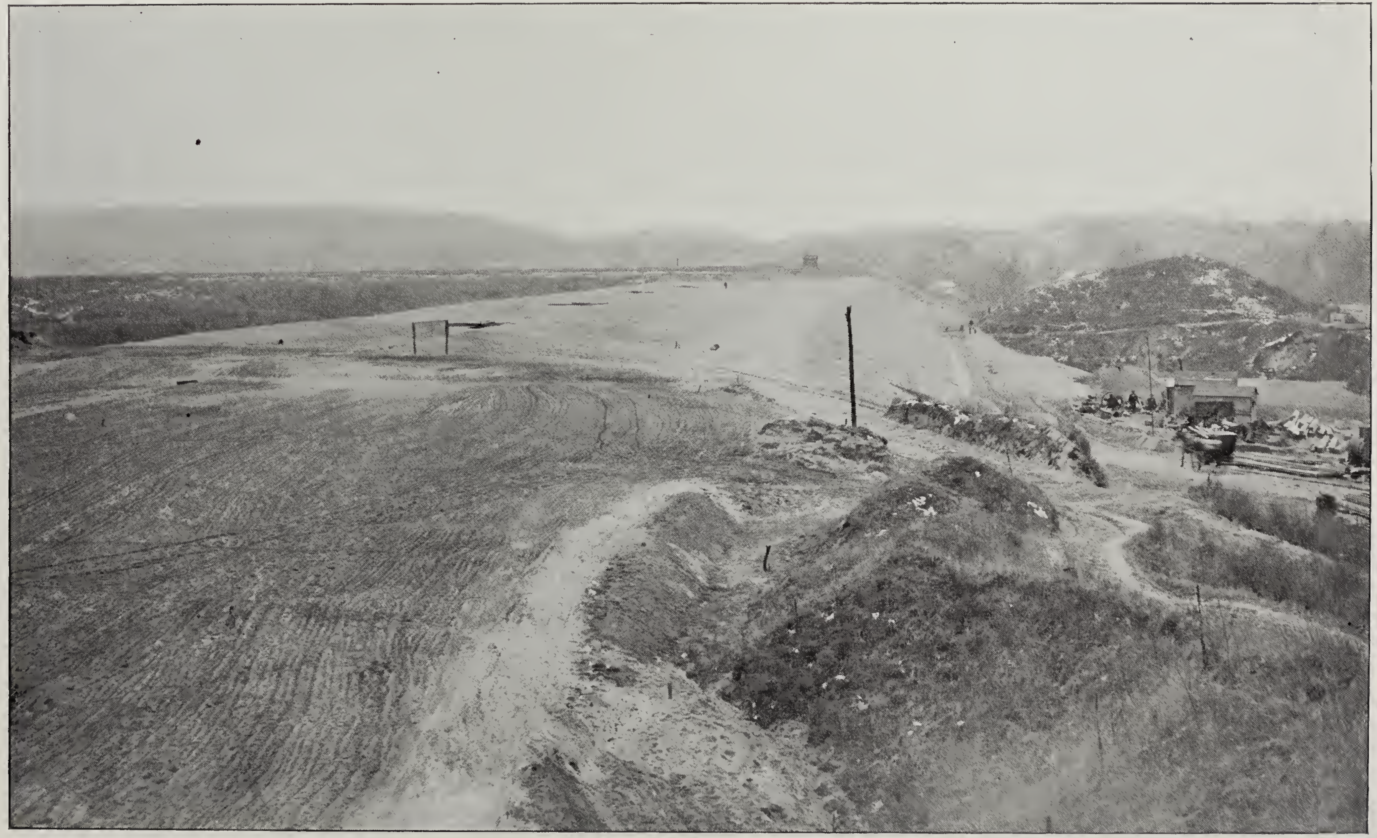
View of the Phœnix dam, showing the Taintor gates at the left and the western spillway at the right, while a portion of the eastern spillway is seen in the lower left corner of the view.



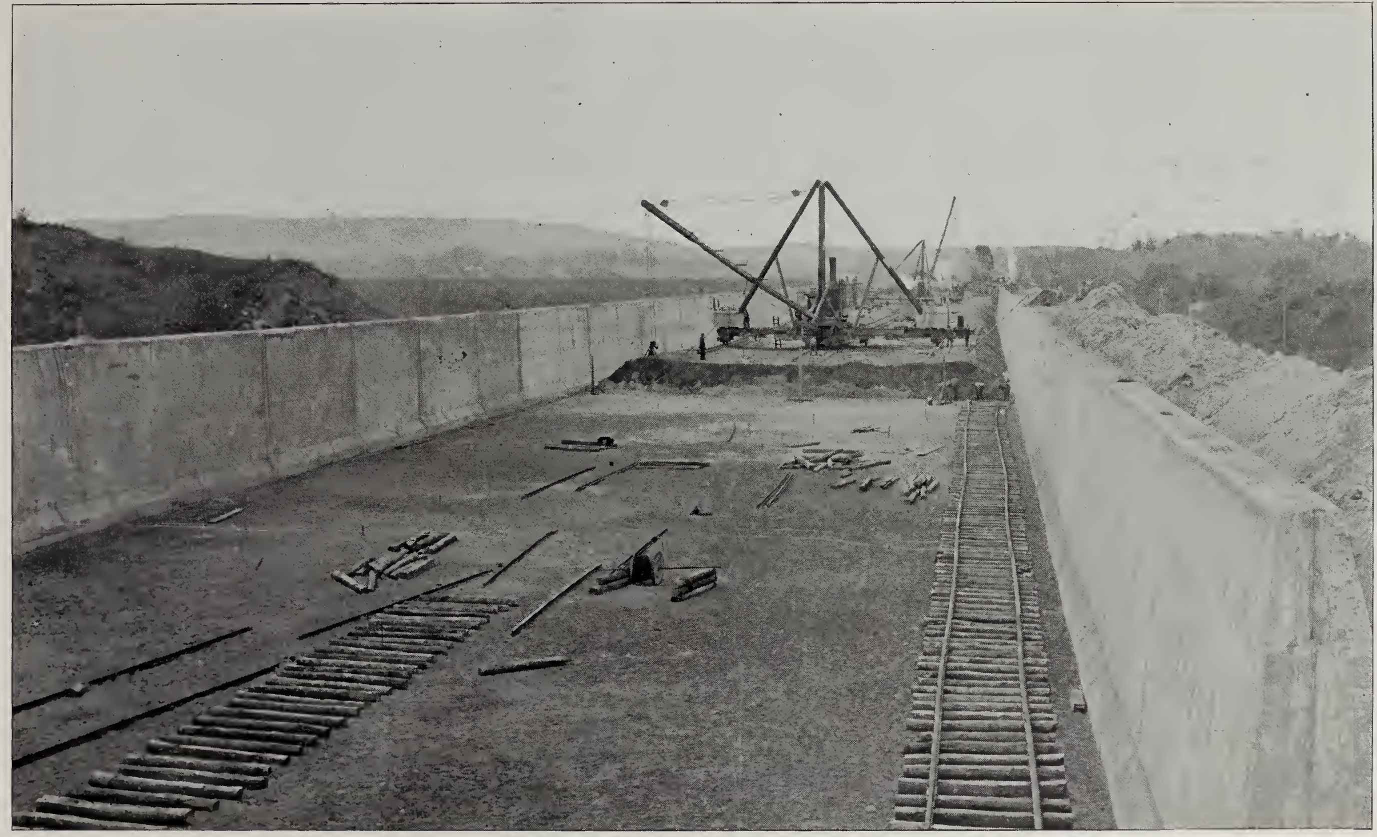
View showing progress in erecting the steel work of the Taintor gates at the Phoenix dam.



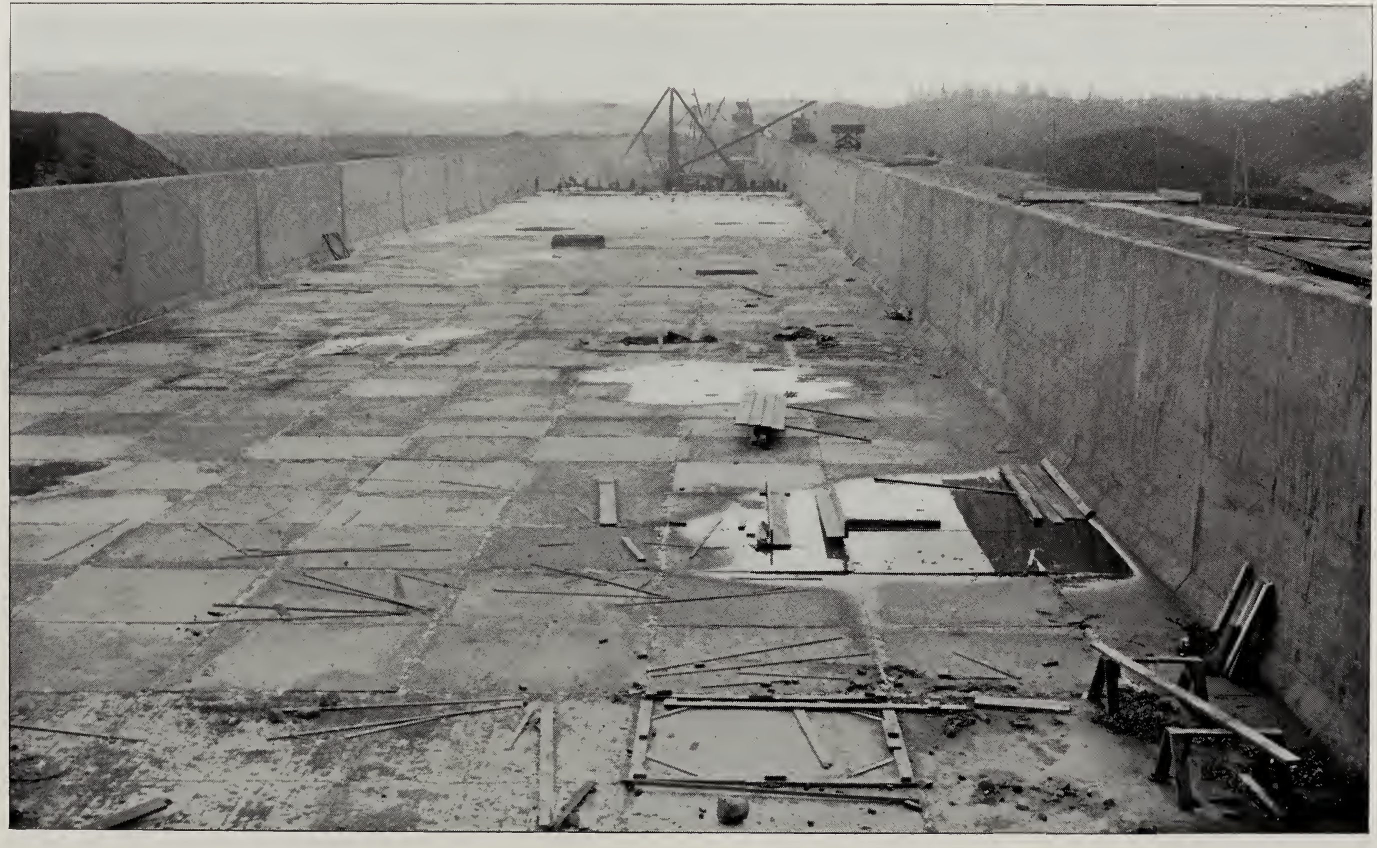
Formation of a large embankment at Irondequoit creek, near Rochester, the material being hauled in dump-cars and spread by water-jets.



Completed embankment at Irondequoit creek crossing.

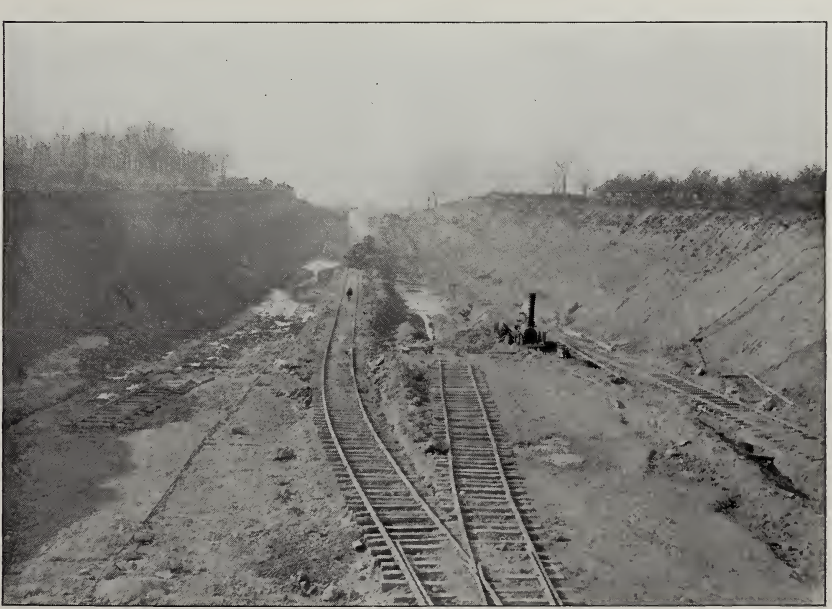


Side walls of the concrete trough upon the Irondequoit embankment.



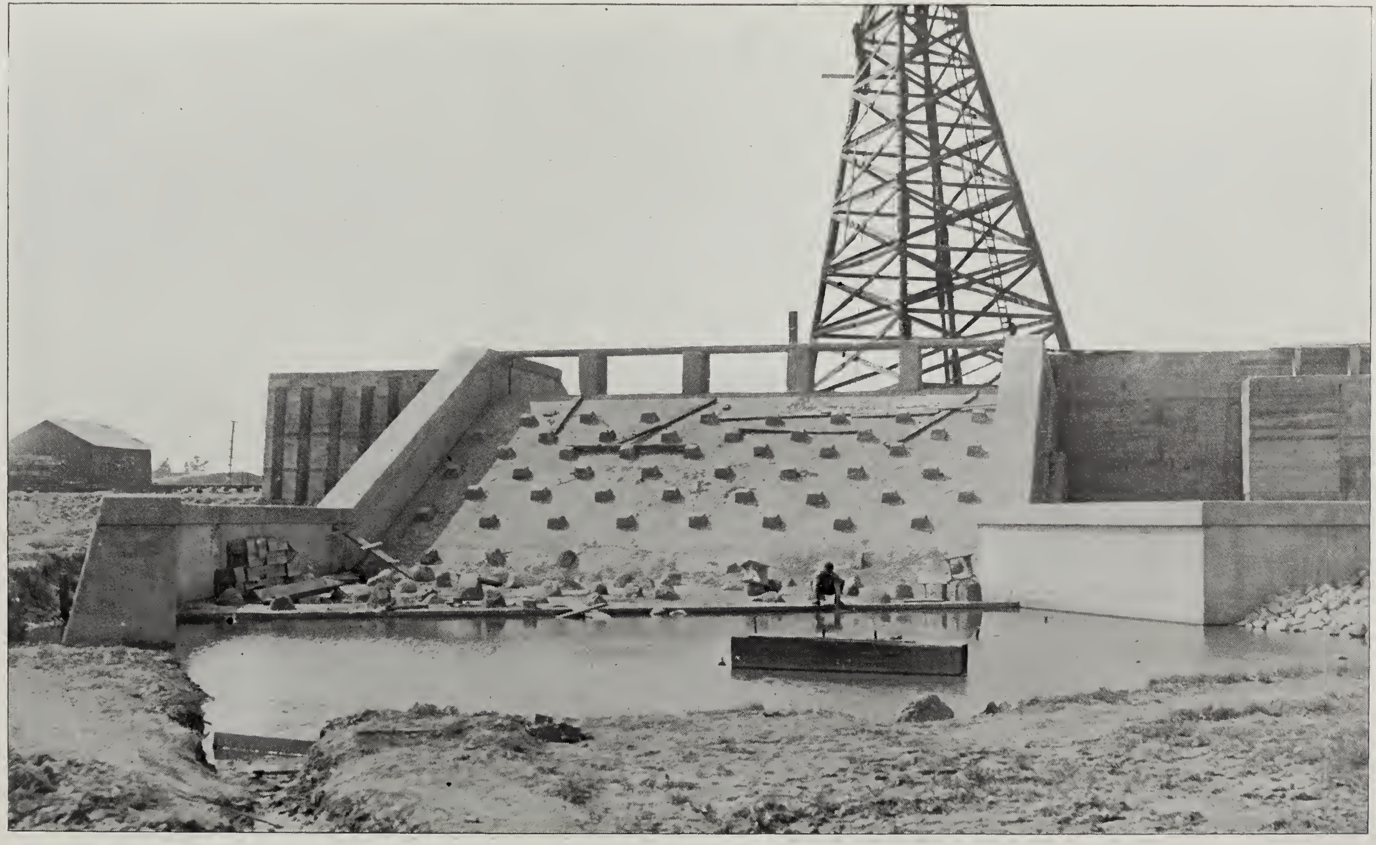
Completed concrete trough upon the Irondequoit embankment. The sides are concrete vertical walls with tie rods connecting with the floor. The floor is made of two courses with a layer of sand between. The bottom course is laid in 30-foot squares and the top course in 10-foot squares.

Section of channel in embankment.

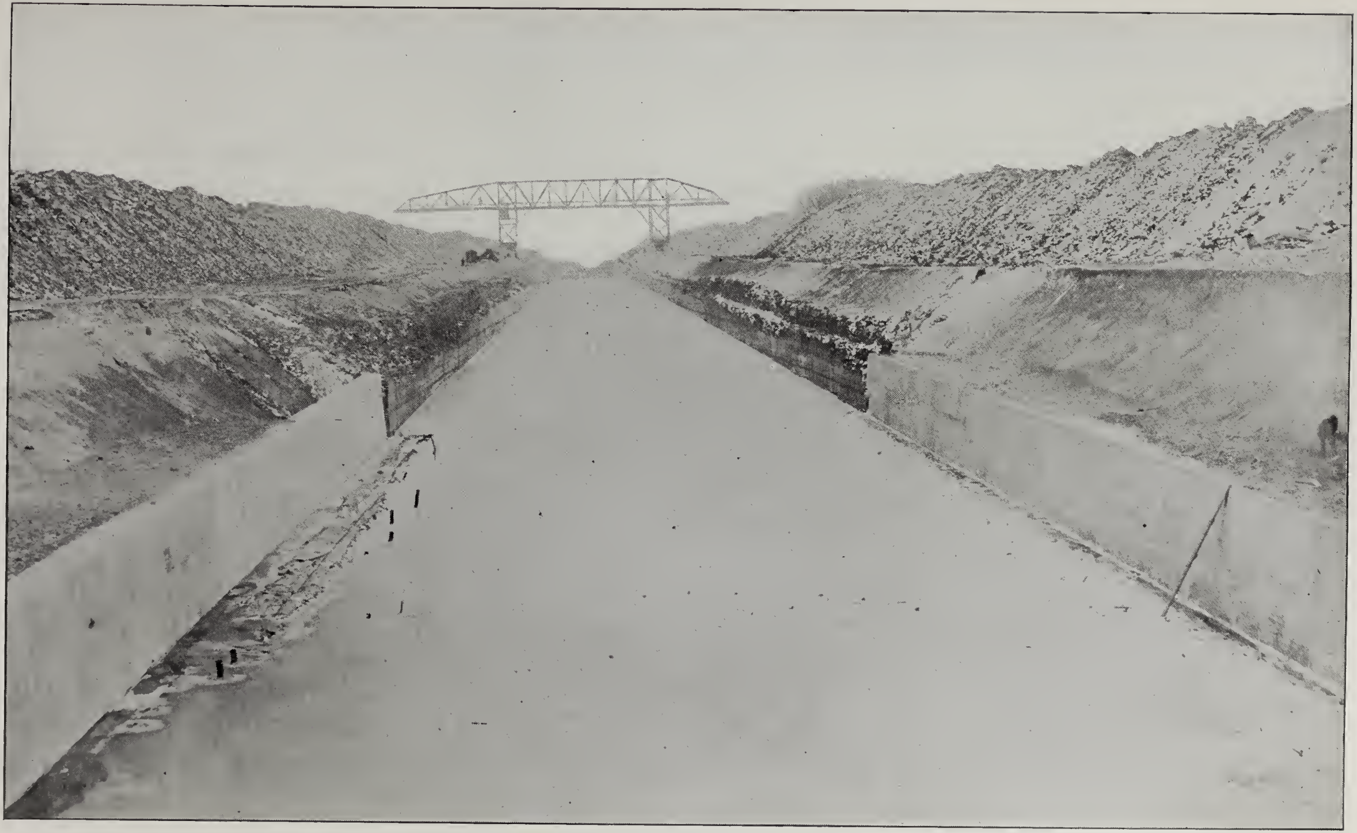


Section of channel in deep cutting.

The canal alignment just east of the Genesee river and south of Rochester passes through a hill that requires a cut of 63 feet at its greatest depth; then it traverses low ground, upon which there must be an embankment, a maximum of 42 feet to top of side banks being necessary.



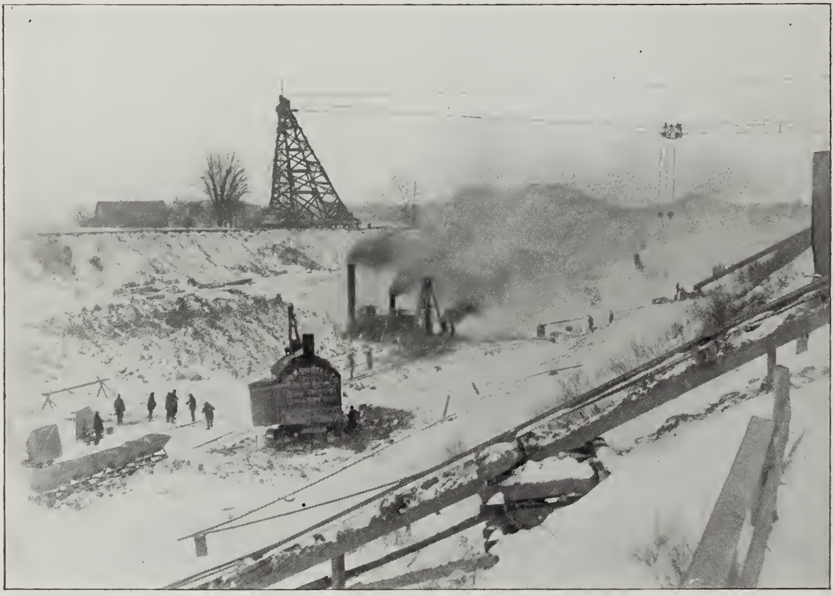
Spillway at the upper end of lock No. 32, near Rochester. Just beyond the spillway is seen the movable tower of the cableway used for conveying concrete in building the lock.



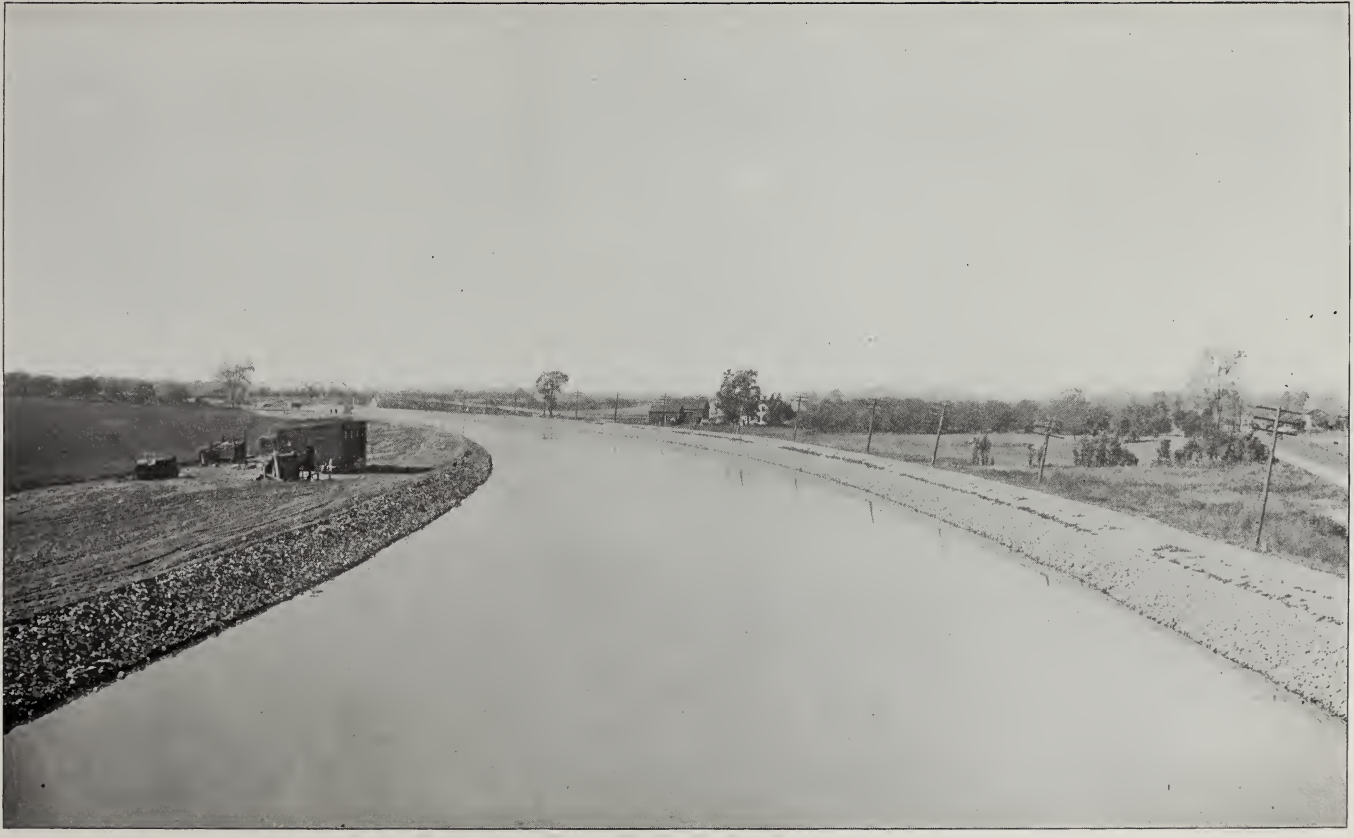
Section of channel near Rochester, with vertical walls in the foreground and rock excavation, channeled below water line, in the distance.

Construction in Western Part of State.

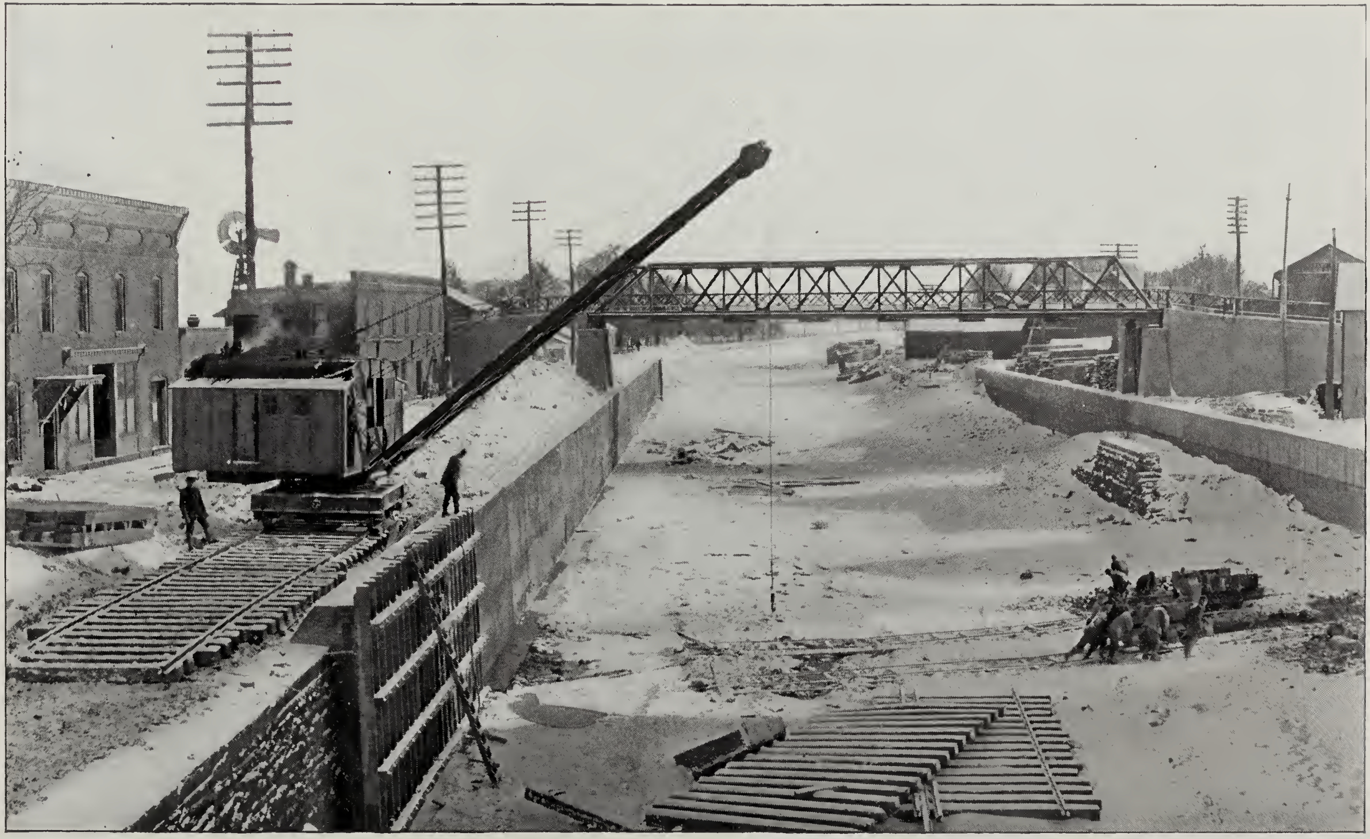
In the western part of the state the enlarged channel follows very closely the line of the old canal. The watercourses lie generally north and south and there are few streams or valleys to utilize. Most of the course is an independent. land-line channel, which is sometimes above the adjacent territory. As it has been necessary to maintain navigation during the open season, the prosecution of the work has been attended with some unusual conditions. The contractors have done their work in sections — above water line and beyond prism limits in the summer and in the prism in the winter. They have also employed machines that may serve in both dry and wet excavation.



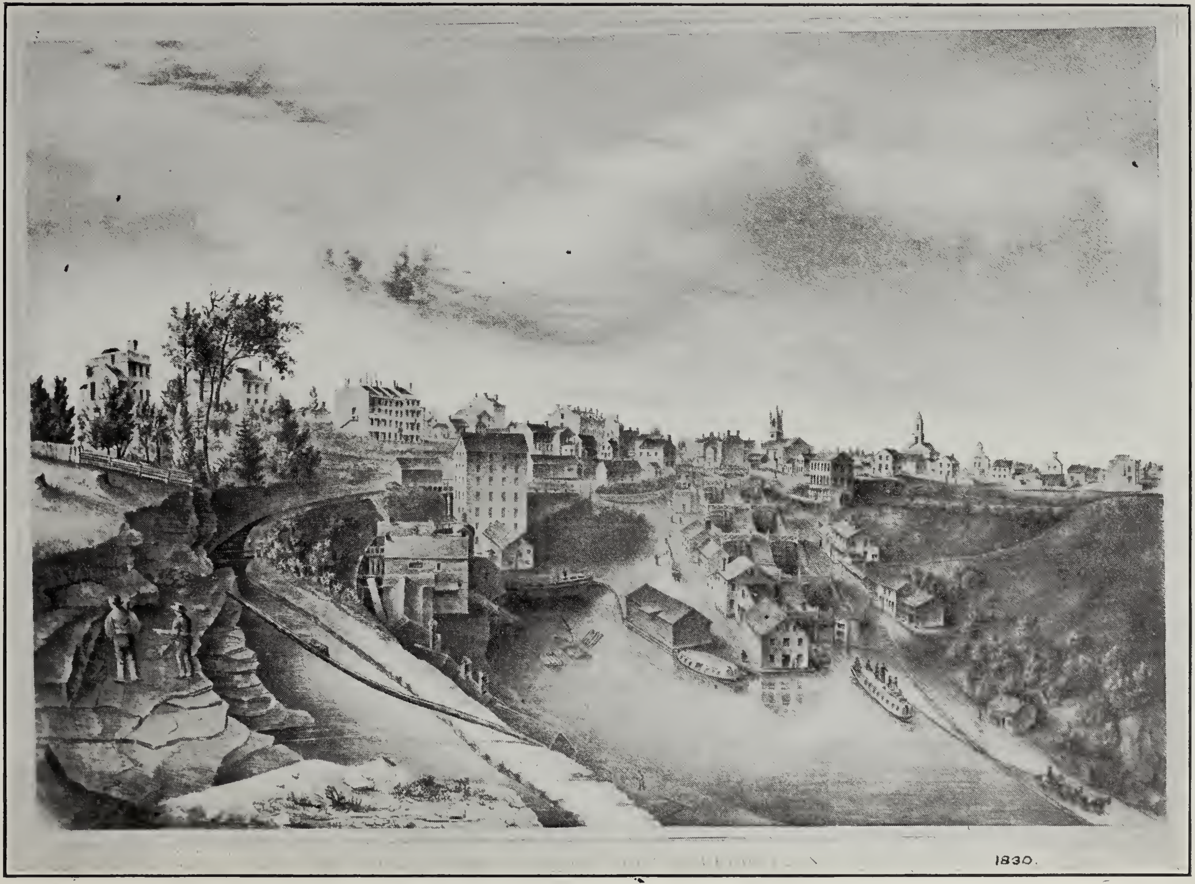
Winter work. As navigation must be maintained during the summer, much of the work has to be done in the winter, when the water can be drained from the channel.



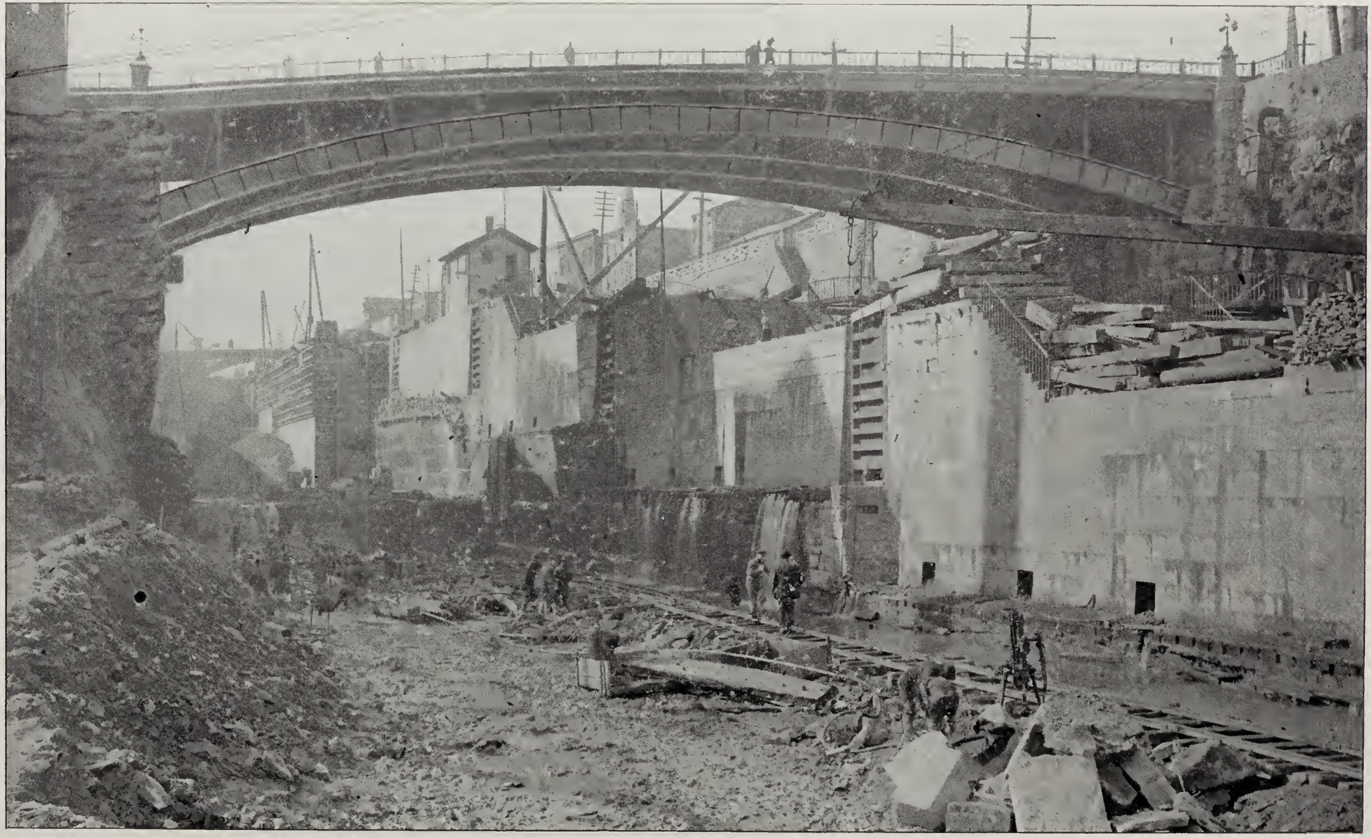
Completed channel, typical of the Rochester–Lockport level, where in general the alignments of the Barge canal and the present canal are identical.



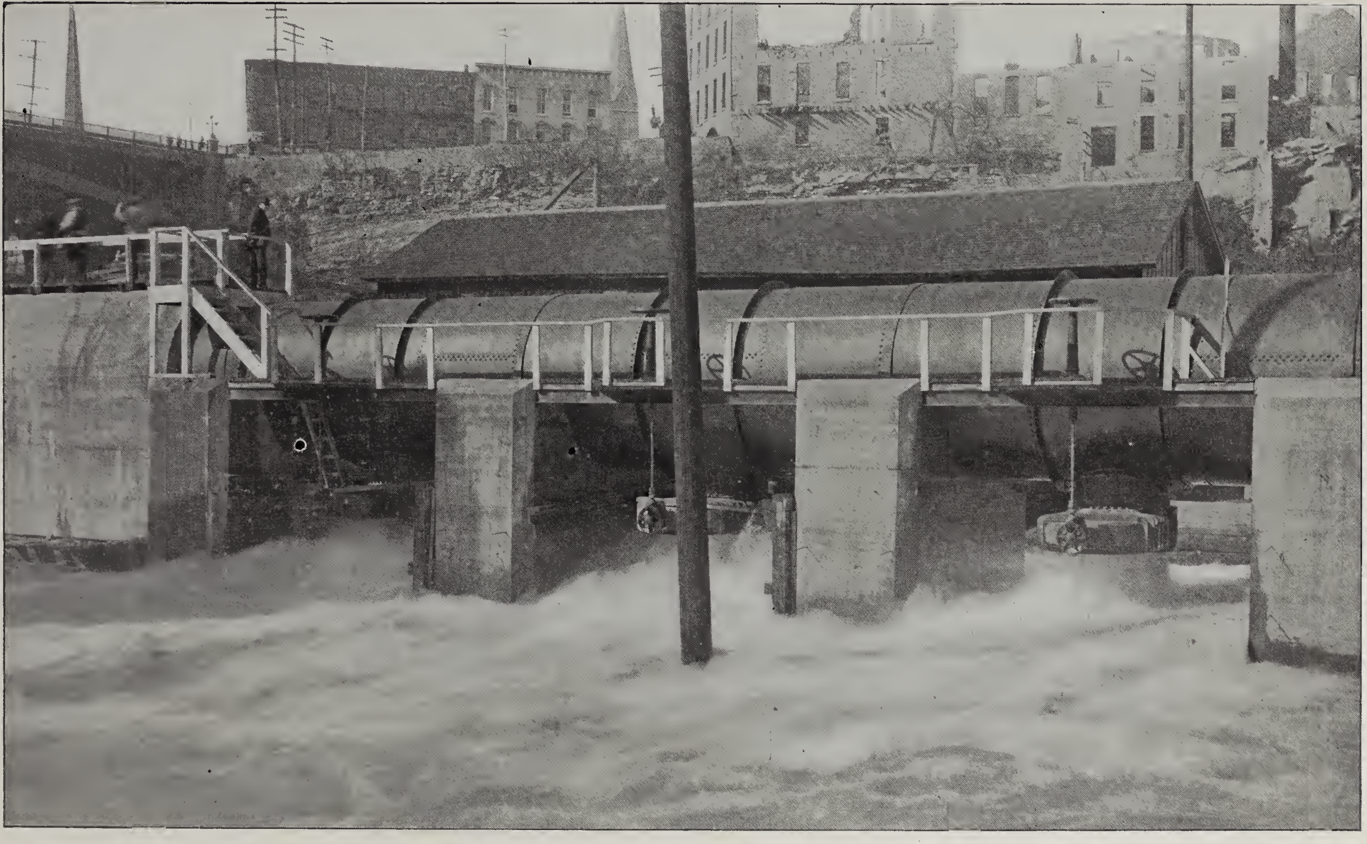
Existing vertical wall faced and topped with concrete. Considerable of the wall built during the 9-foot enlargement in the western portion of the state has been thus utilized.



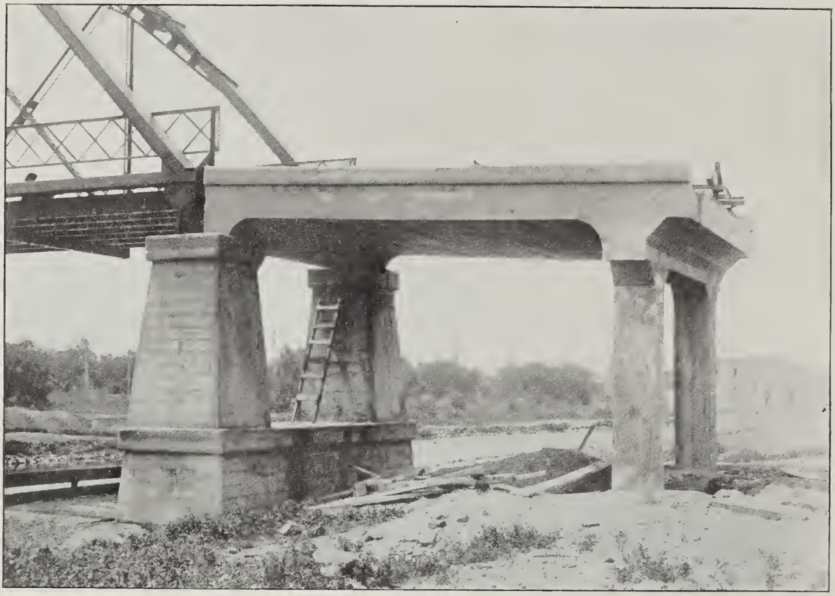
Reproduction of an old drawing, showing the original combined locks at Lockport.



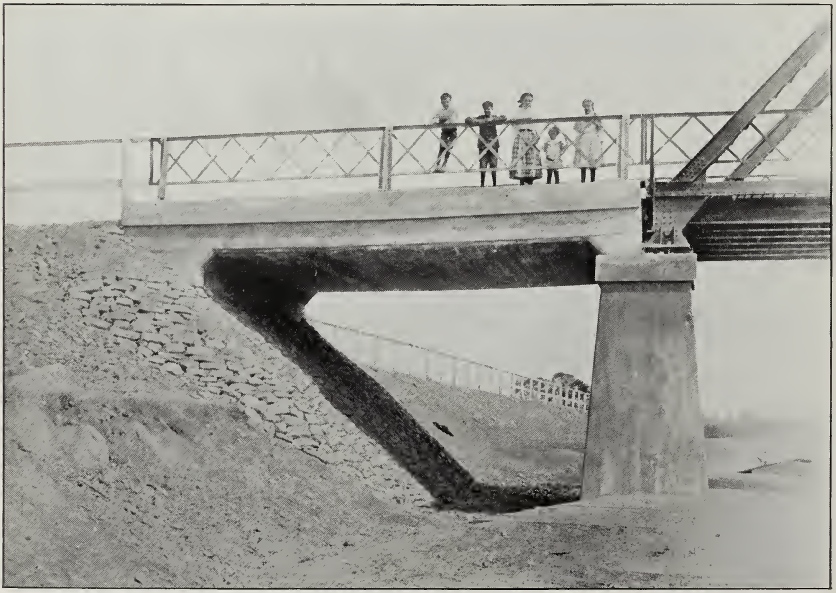
Construction of the flight of two locks at Lockport, having a combined normal lift of 49 feet. In the present canal there was a flight of five double locks. The new locks replace the south tier, the north tier caring for navigation during construction and to remain for small boats of the future. At the upper end a portion of the new side wall is seen built against the north side walls of the old south tier of locks.



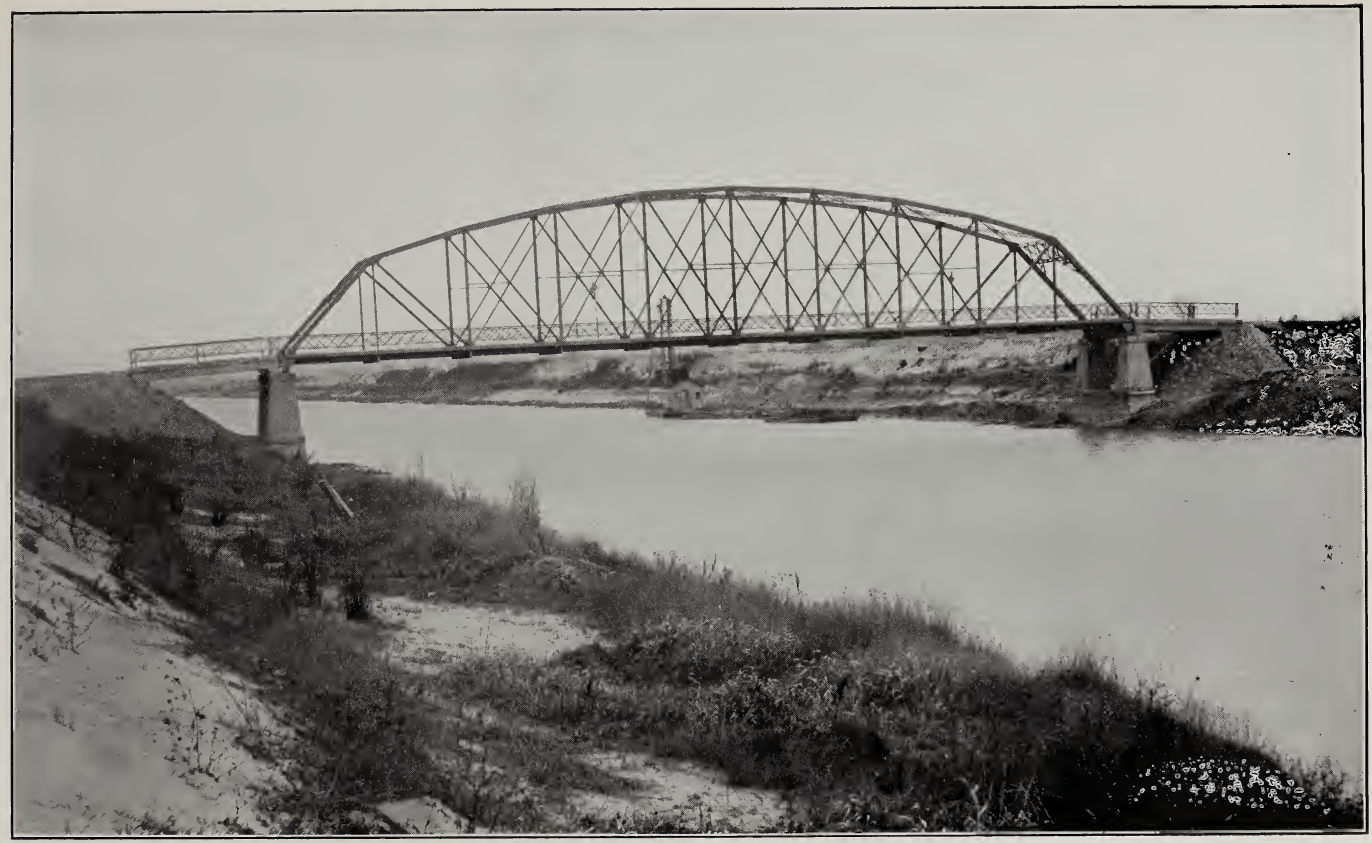
Outlet valves of the flume at the foot of the Lockport locks. Feed water is carried around the locks through a tunnel.



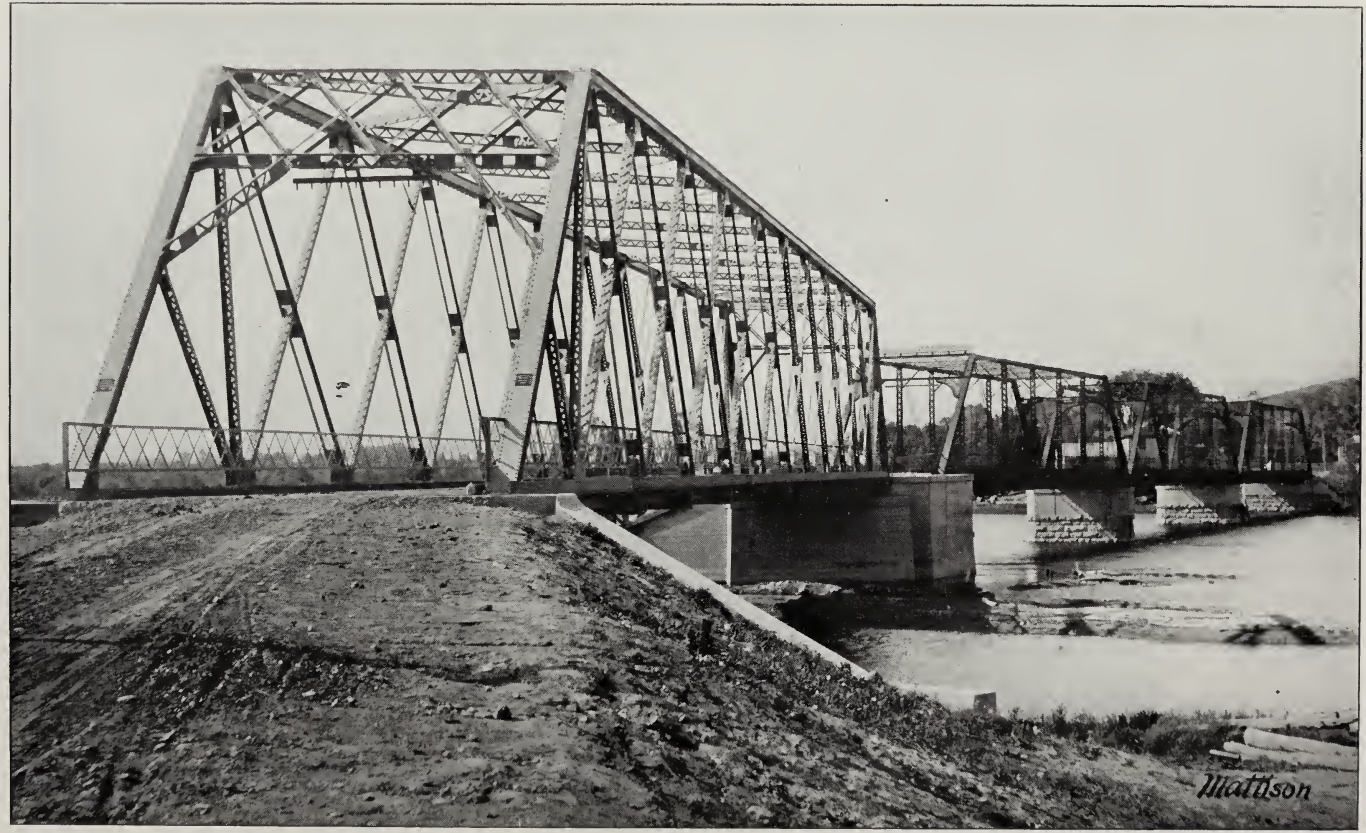
Type of bridge abutment devised in making Barge canal plans, to economize in both masonry and embankment.



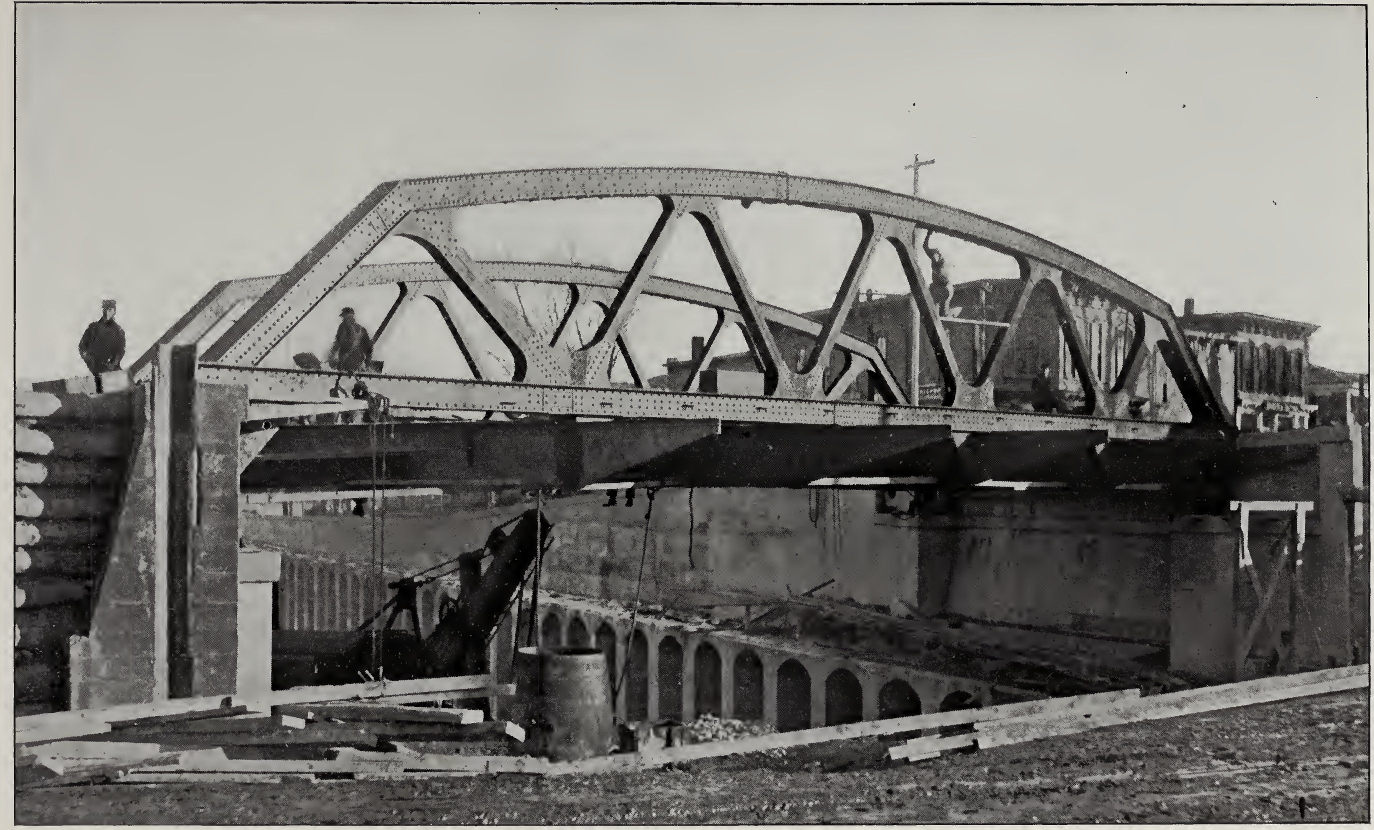
New type of bridge abutment, with approach completed.



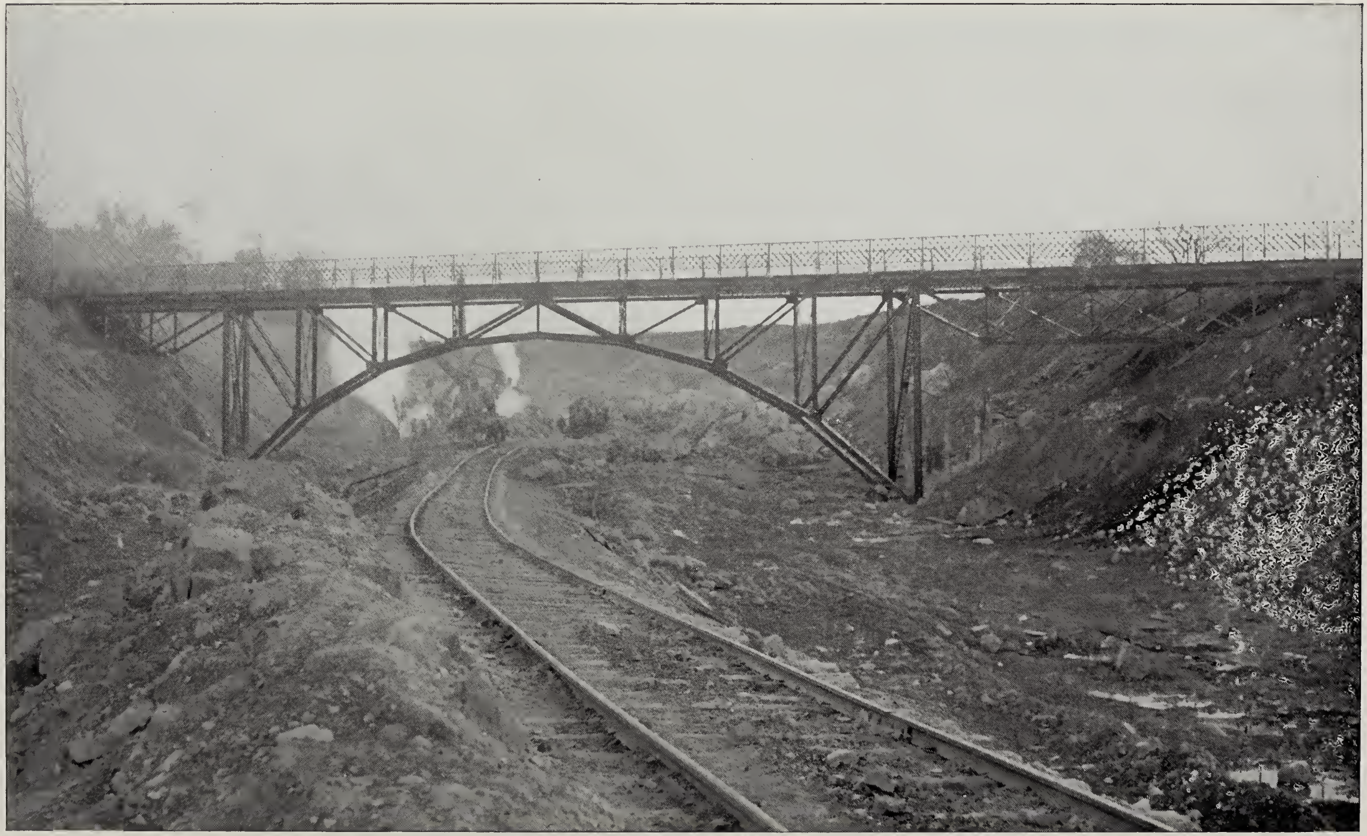
Highway bridge over the new channel a little east of Oneida lake.



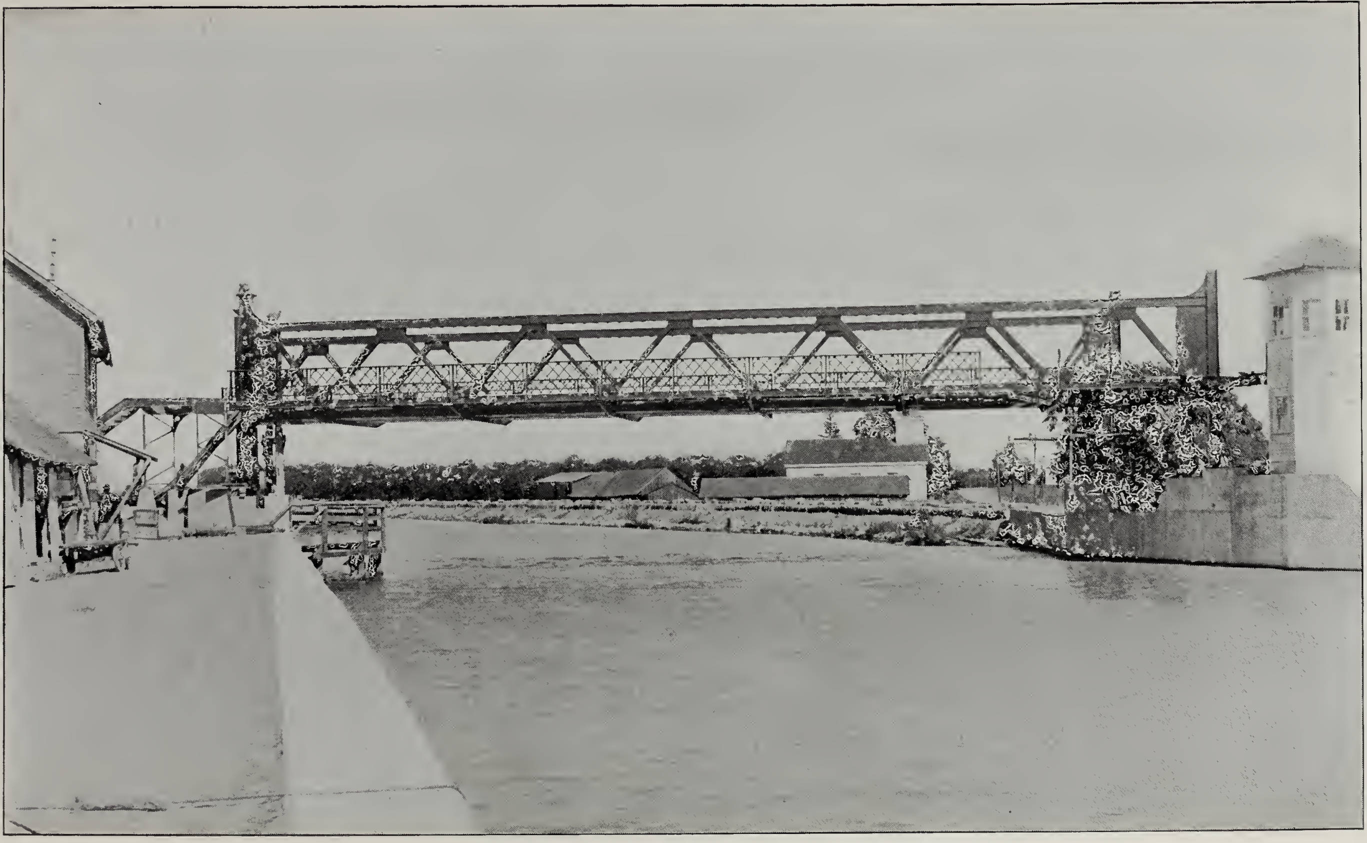
Highway bridge at Mosquito Point; one span over the canal channel and three spans over the Seneca river channel.



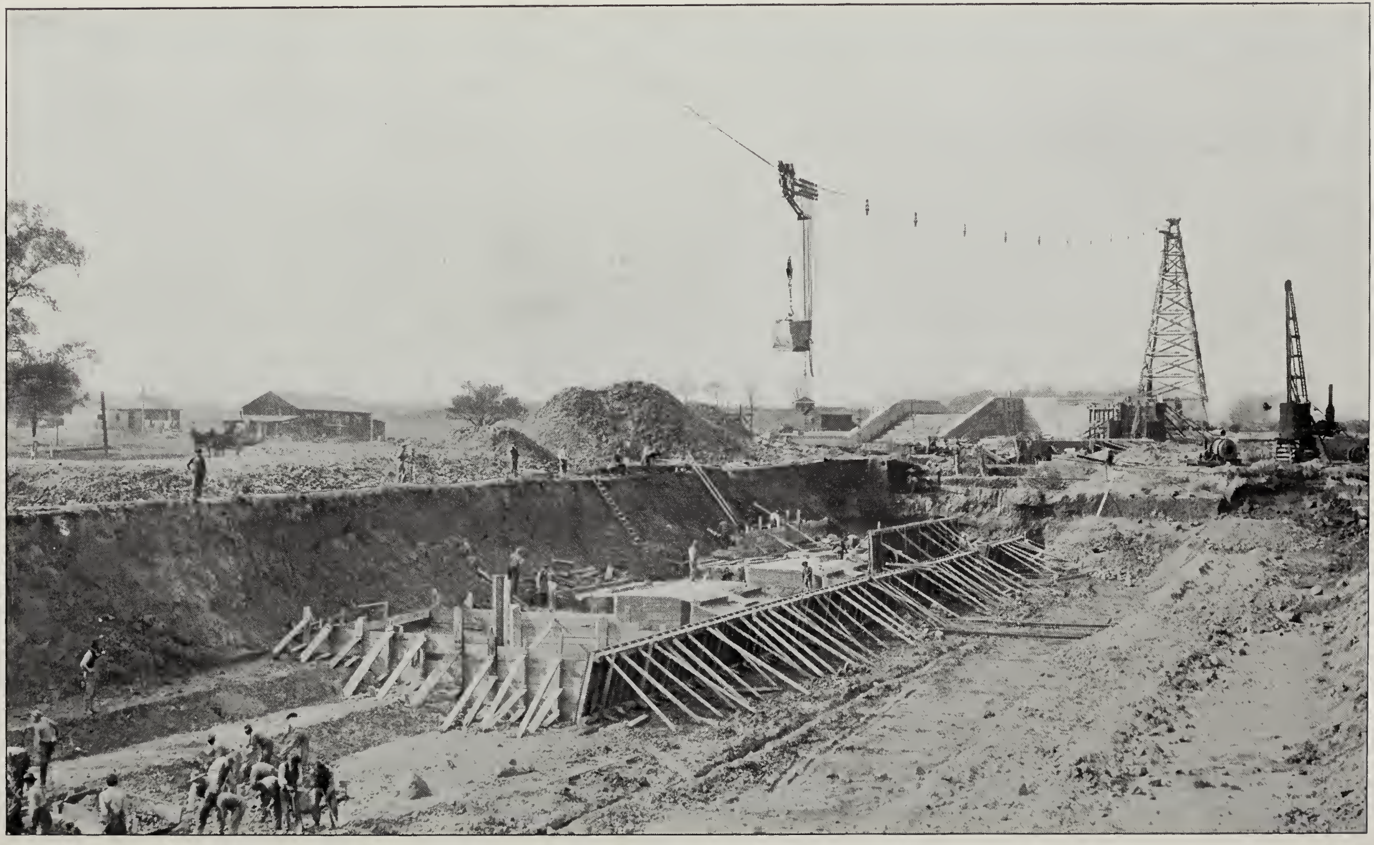
Bridge at the foot of lock No. 24, Baldwinsville, built for highway and trolley traffic.



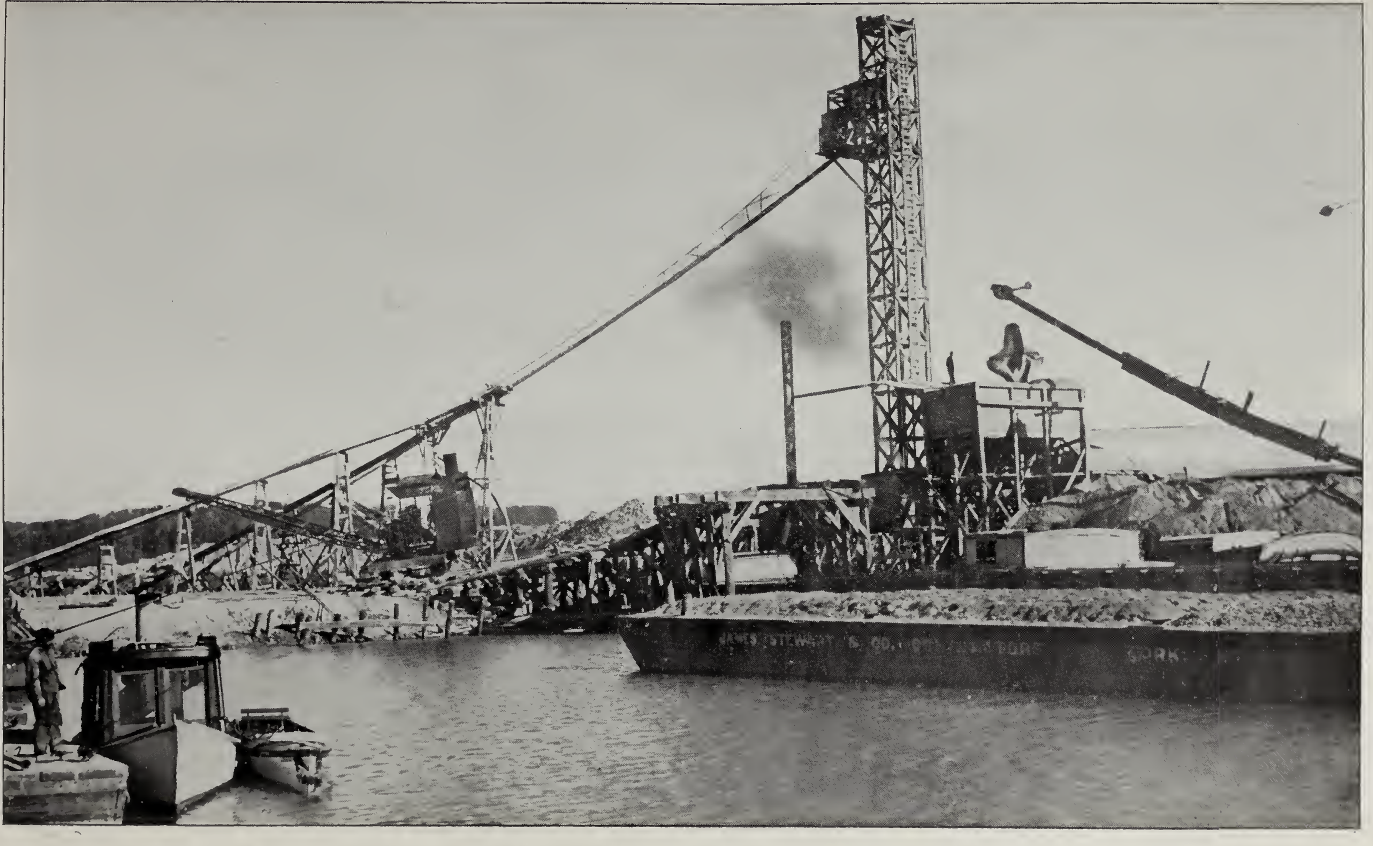
Highway bridge at Brooks avenue, near Rochester, over new land line channel in deep cutting.



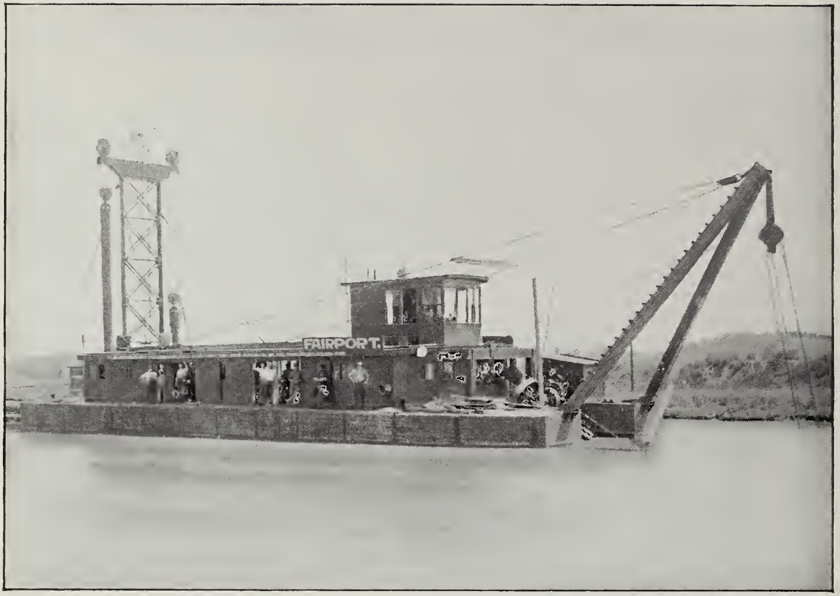
Lift bridge over the enlarged channel at Eagle Harbor.



Lock No. 32, near Rochester, during early operations. The concrete was conveyed by cableway from a mixer at the foot of one of the towers. The movable tower is shown in the view.

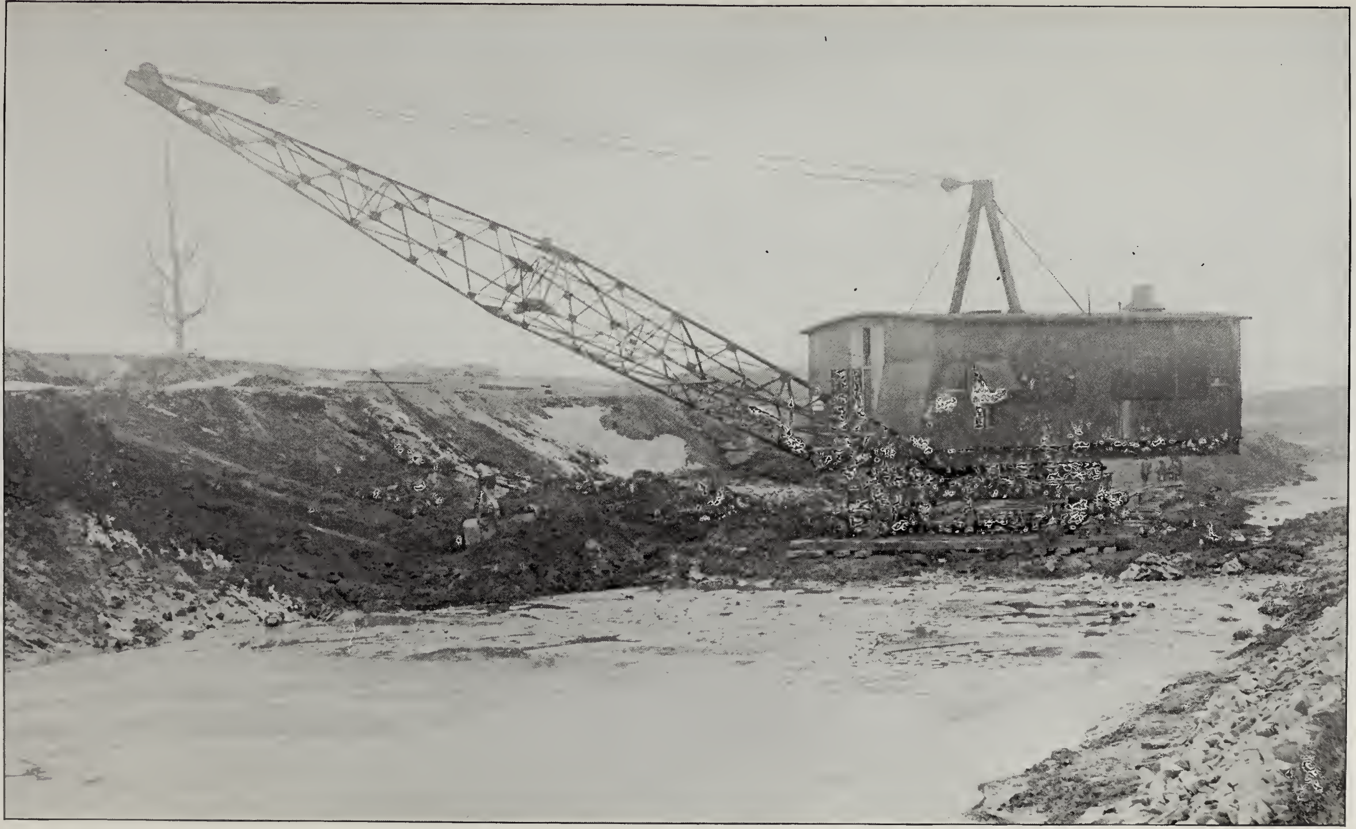


Concrete plant at lock No. 23. A tower, with distributing chutes leading to the lock walls, is shown.

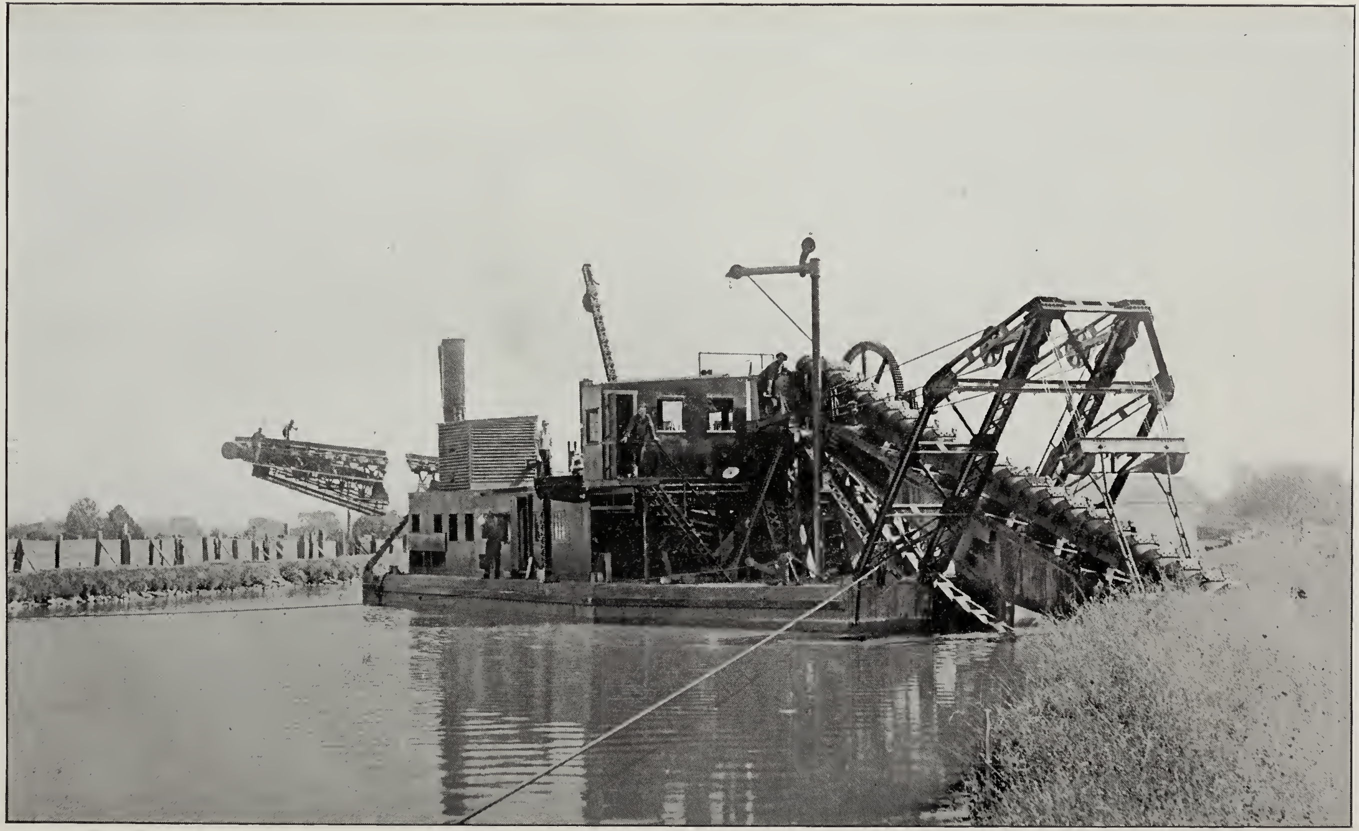


Hydraulic dredge, operated by electric power, at work a few miles east of Rochester, where the old and new channels coincide in alignment.

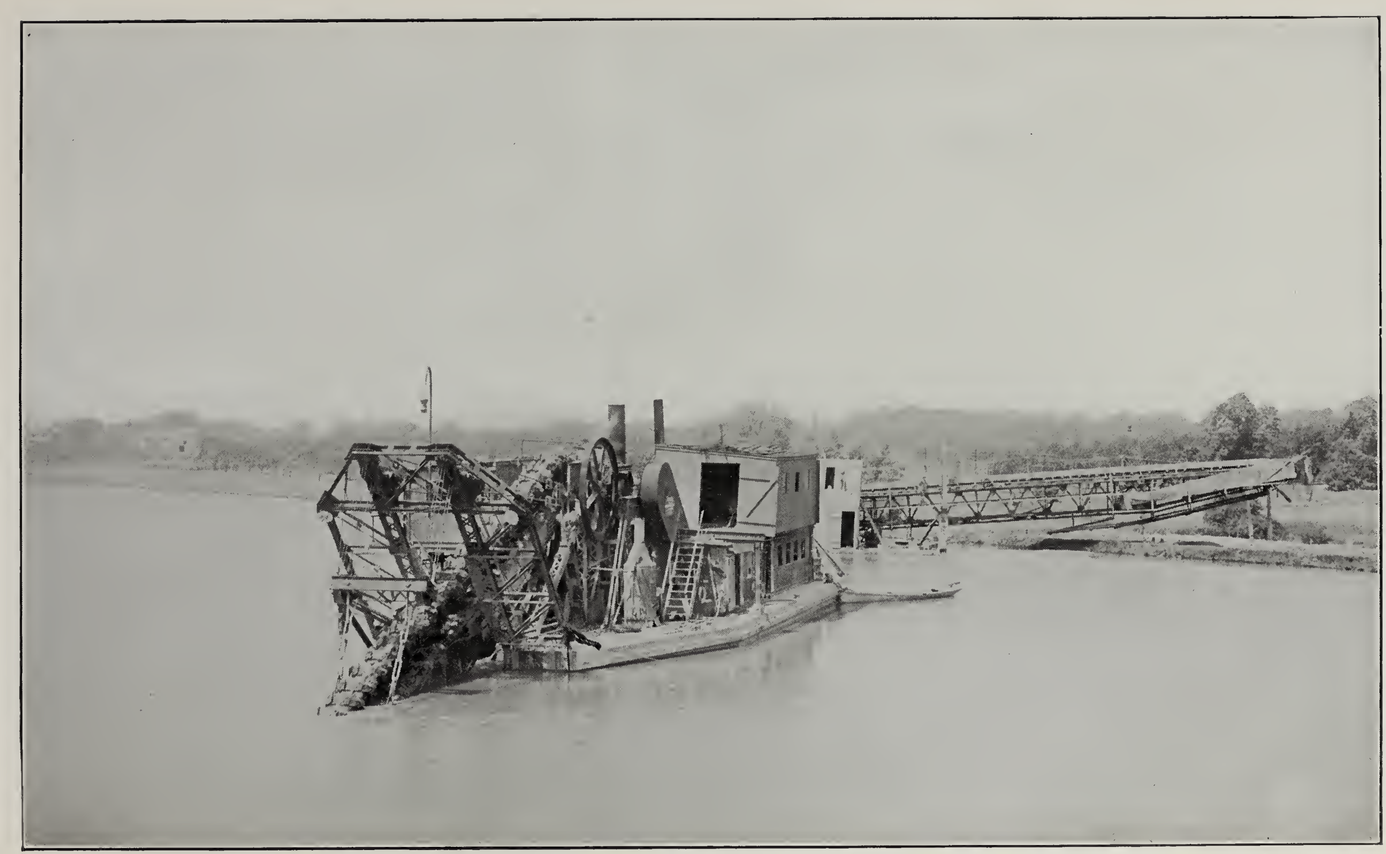
Revolving excavator, with scraper bucket, operating during the season of navigation, where alignments of old and new channels coincide.



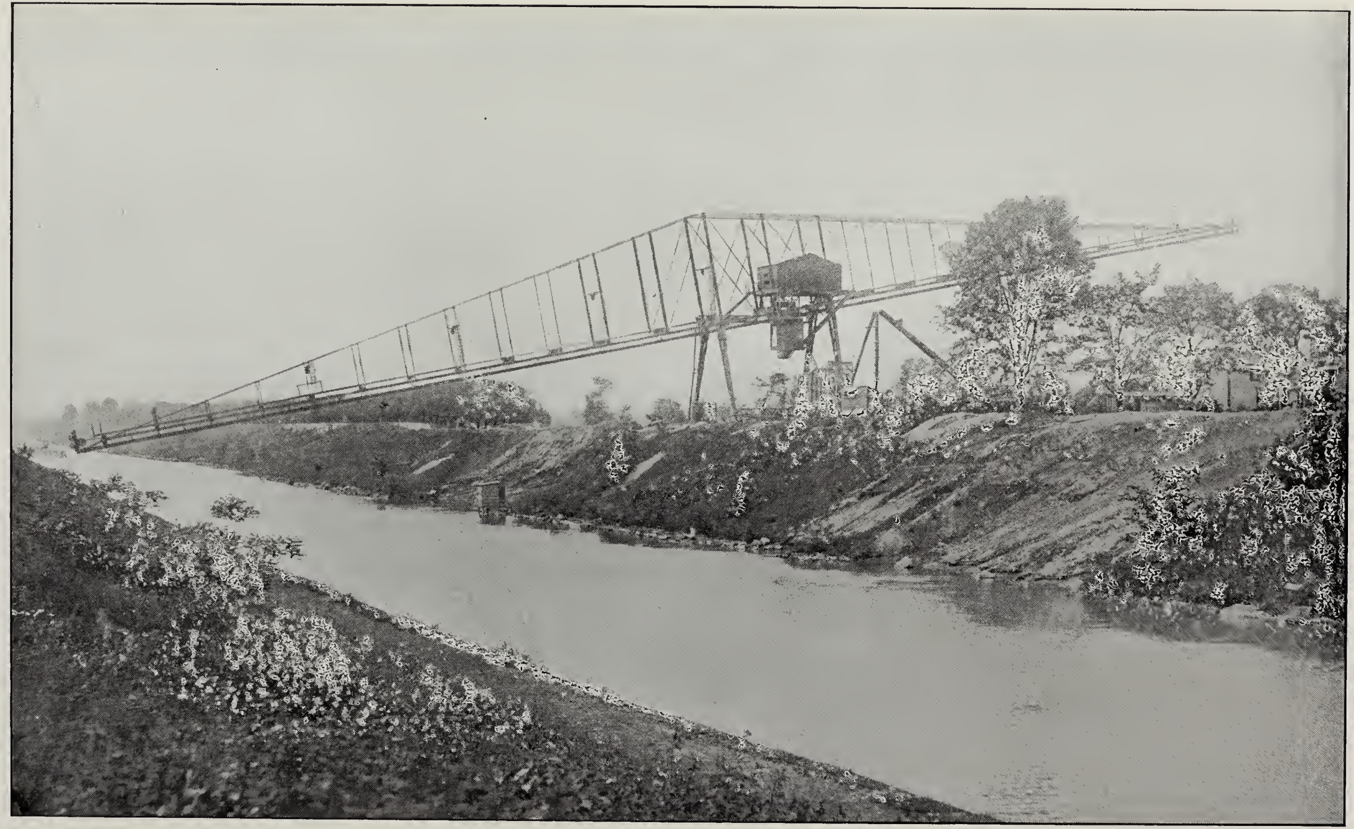
Revolving excavator, operating during the closed season, where alignments of old and new channels coincide.



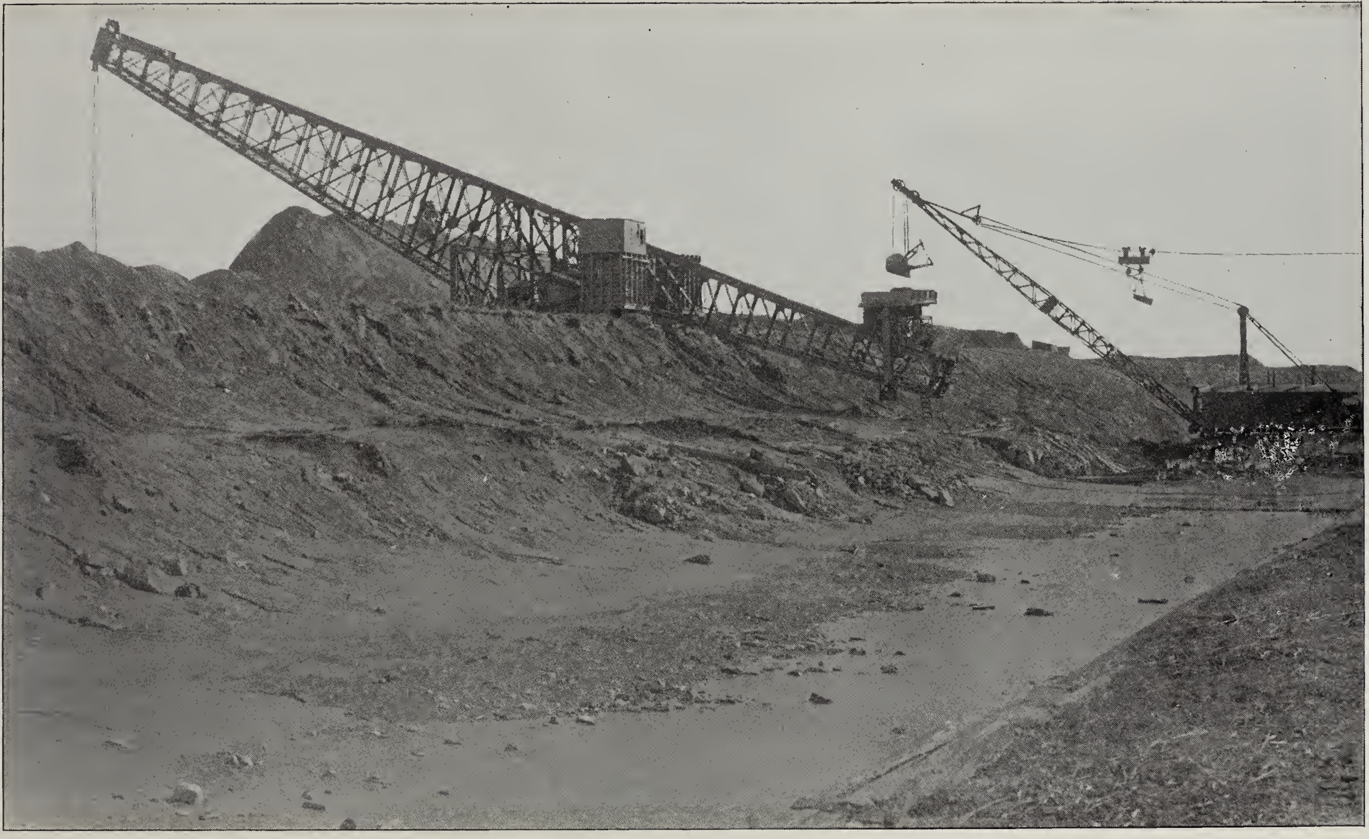
Front view of ladder dredge, used during the navigation season for excavating where the new and old channels coincide in alignment.



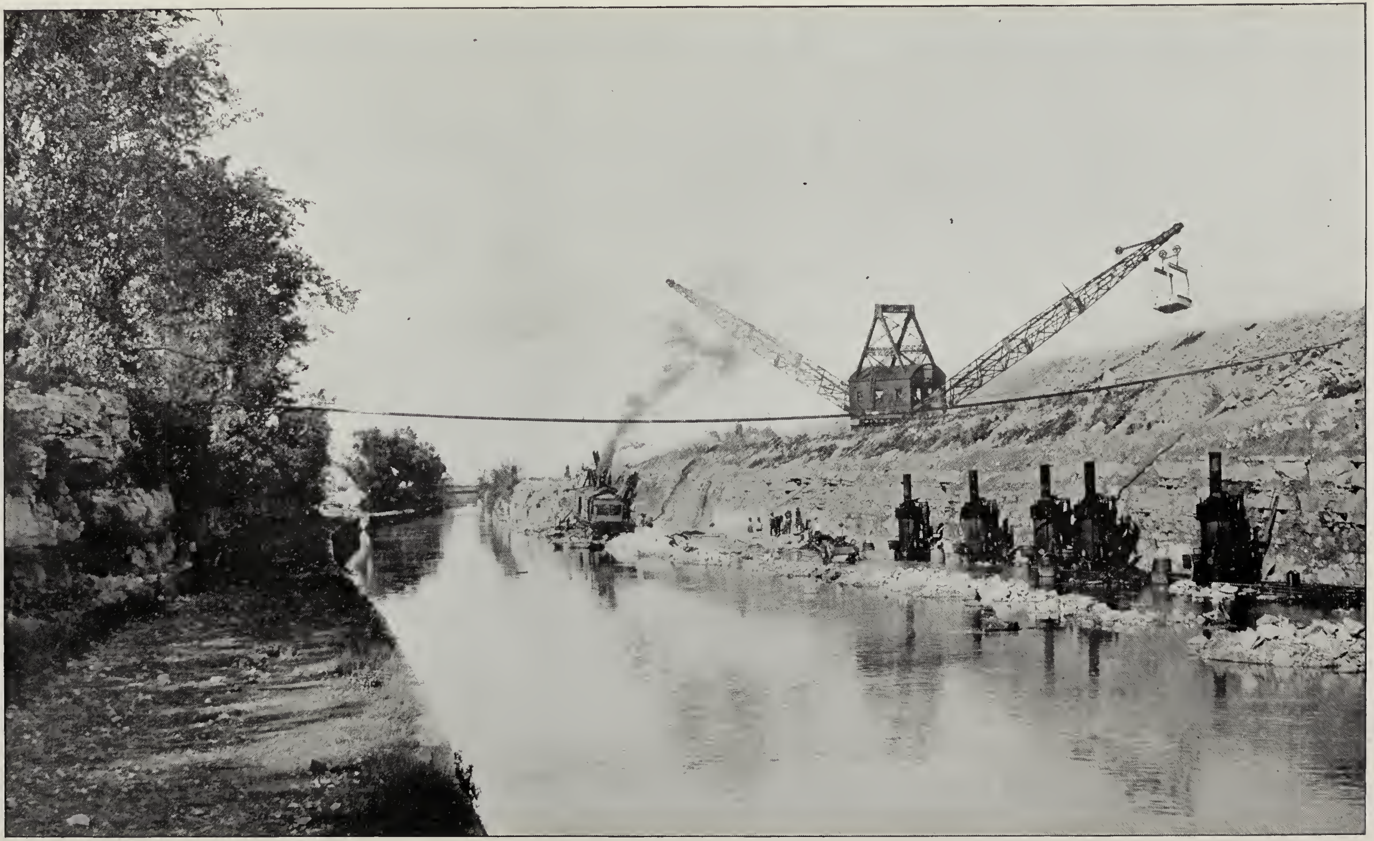
View of ladder dredge, showing belt conveyor device for carrying excavated material to spoil bank.



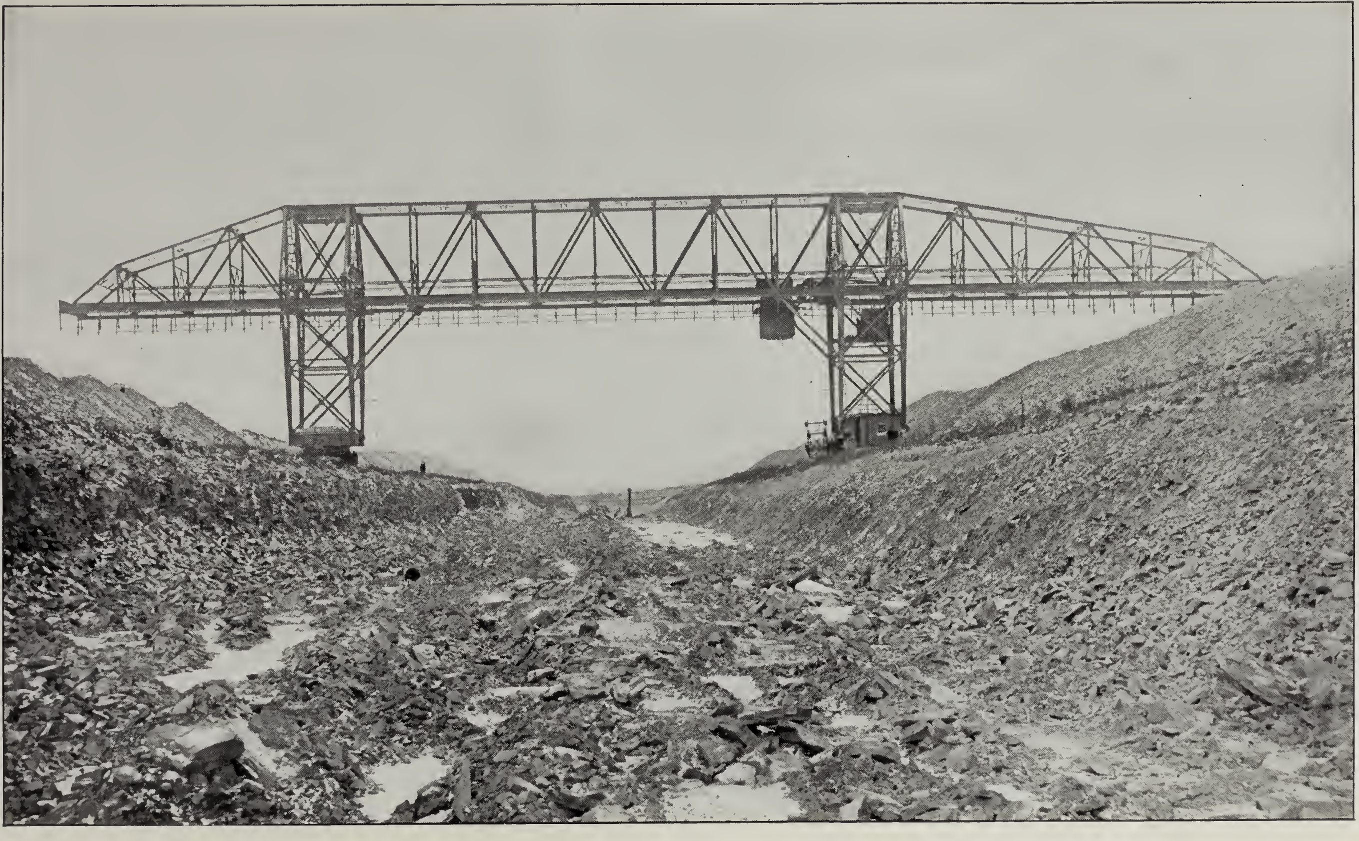
Cantilever crane, spanning channel and reaching back to spoil bank. Using a drag scraper, it has worked both with and without water in the canal.



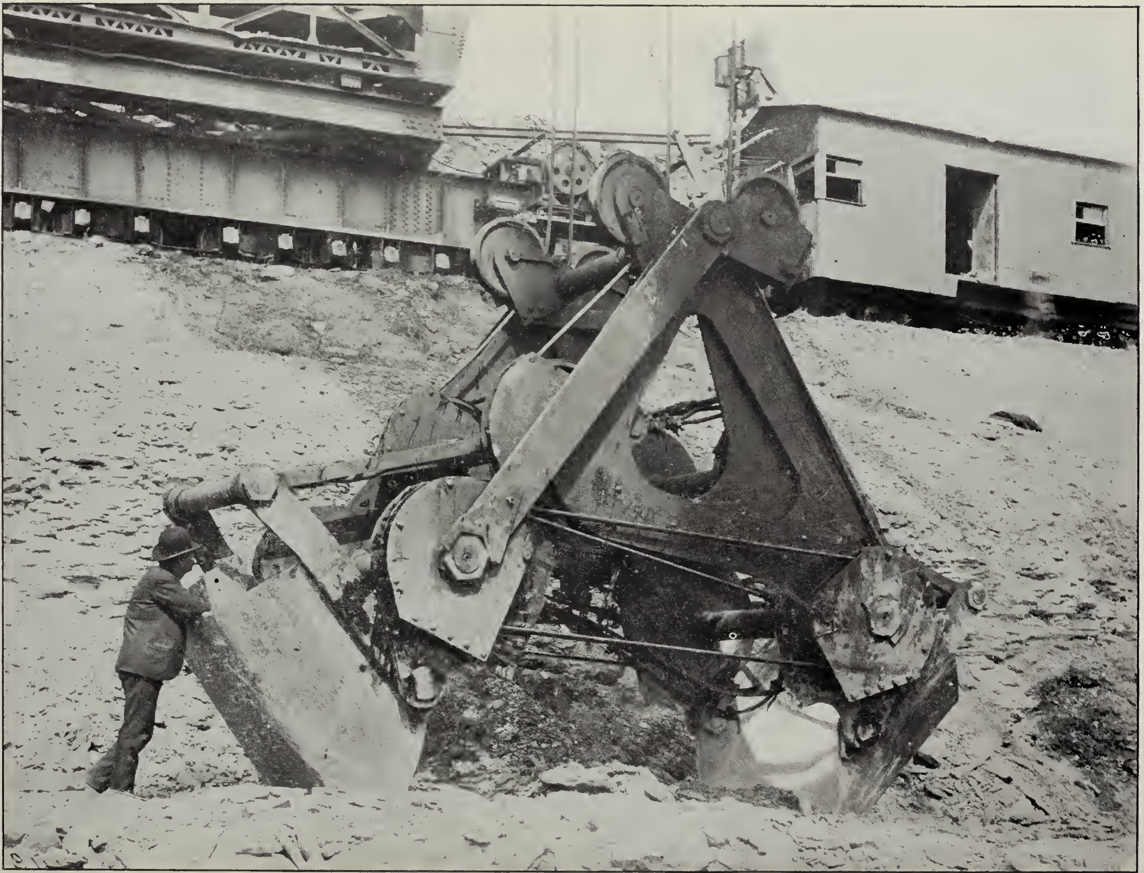
Revolving excavator and tipple incline conveyor operating in the prism west of Lockport, when the water is out of the canal.



Double-boom conveyor, steam-shovel and battery of channelers widening the canal in rock cut just west of Lockport, down to water surface, during the navigation season.



Bridge conveyor, operated by electricity, used for excavating in a deep rock cut near Rochester. Extreme length, 428 feet.



Bucket of bridge conveyor. Weight, empty, 21 tons. Capacity, 12

UNIVERSITY OF ILLINOIS – URBANA
N30112066919926A